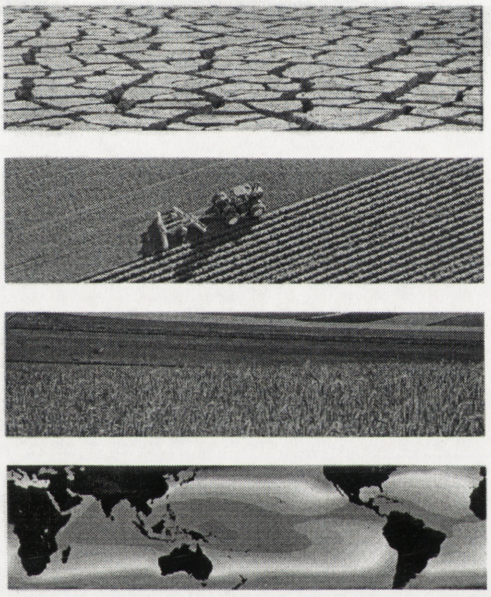
Farming with El Niño and Info Glut

How do farmers acquire scientific information?

Julian Lee



Farming a Sunburnt Country

MANAGING AROUND AUSTRALIA'S HIGH-RISK CLIMATE

Produced by the Bureau of Meteorology
in association with Cox Inall Communications and Sadako Films Pty Ltd

BUREAU OF METEOROLOGY

COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

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Originality

This thesis is entirely original and all sources have been acknowledged.

Julian Lee (July 1998)

Abstract

With the introduction of the National Drought Plan (1992), the government seeks to make farmers more self-reliant when it comes to dealing with climate variability. To assist farmers become more self-reliant, a wealth of scientific information — some would say an information overload — is available.

The objectives of this study were to determine how farmers seek out and acquire scientific information. It also aimed to evaluate a mixed media education kit for its effectiveness in communicating about El Niño. Interviews were therefore conducted with six farmers who had bought the kit as well as some of the producers of the kit.

The findings revealed that farmers believe El Niño to be irrelevant to their situation and therefore are not motivated to seek scientific information about it. On topics that they are motivated to learn about, farmers prefer to seek out personal contacts as they are more able to deliver information that meets the needs of the farmer. When using non-personal information sources, farmers expressed a need to be able to identify rapidly whether the information was relevant and to what parts of it they should pay attention.

Implications for science communication and farmers were addressed in the study. In particular, methods to facilitate the acquisition of information by farmers and improve mixed media education resources were identified.

Acknowledgments

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Table of Contents

Chapter 3: Methodology

Chapter 4: Results

Chapter 5: Conclusions

References

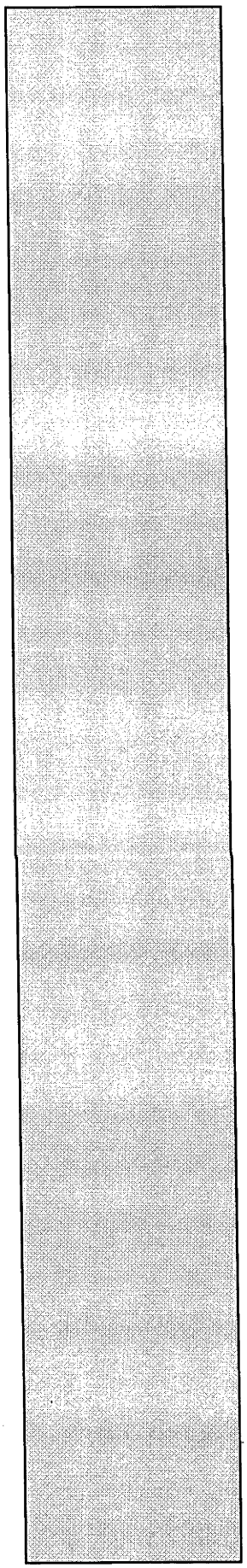
Appendices

Tables

Figures

Chapter 1:

Introduction



Background to the Study

As a result of the National Drought Policy (1992), drought assistance is now provided in Australia only after a declaration of "exceptional drought circumstances". Under this policy, drought is no longer considered to be a natural disaster but rather, an integral part of a highly variable climate. Thus the government seeks to encourage agricultural producers to adopt self-reliant approaches in managing for climate variation. (http://enso.unl.edu/ndmc/mitigate/policy/austral.htm, accessed 18/7/97)

For farmers to become self-reliant, an understanding of meteorological processes is crucial. Since the need to become self-reliant has been imposed by the government, responsibility lies with the government to facilitate this process. In fulfilment of this obligation, various government agencies including the Department of Primary Industries and Energy (DPIE) and the Bureau of Meteorology (Bureau) provide a range of services and information resources for farmers relating to climate and farm management.

While the 1992 Act may provide an additional imperative to supply information to farmers, it is not a new process to these departments — the DPIE and Bureau have provided over 100 years of scientific climate data. Government agencies are not the only providers of relevant information however, with other sources including the media and private consultants. Furthermore, primary producers have years of personal experience on the land and have their own climate data. The diversity of different information sources has led to significant communication difficulties despite the common interest.

The problem with communicating scientific information

The scope for communication difficulties between different parties and via different media is further complicated by the highly scientific subject matter — meteorology. The communication of such scientific information, or "science communication", is a

burgeoning field where the importance of effective communication between scientists and non-scientist is being recognised and explored. Since it is a relatively new field, little research has been done into how various forms of science communication are received by different audiences. Nor has there been much research on how people seek scientific information or for what purpose.

The communication of agricultural science between scientists and farmers is called "extension". "Extension officers", who facilitate this process, have traditionally used a "linear transfer" model of communication. The linear transfer model is a one-way process of information flow — from scientist to farmer through the extension officer. Practitioners of this model often categorise farmers according to the speed at which they adopt technology — from innovator to laggard. This model is recognised to have serious limitations.

As a result, participatory models of agricultural extension have been developed to overcome limitations in the linear transfer model. Participatory models recognise the value of farmers' knowledge in guiding scientific investigation and providing scientific knowledge. These models also recognise that farmers are not necessarily a homogeneous audience, and thus different information will be relevant to different farmers. To reach different farmers therefore, various communication strategies are needed. What the needs of farmers are, and how they respond to various strategies, however, is unknown.

The DPIE has created an education kit called *Farming a Sunburnt Country.* It is an example of one communication strategy and is the subject of this sub-thesis.

Farming a Sunburnt Country

Farming a Sunburnt Country is a meteorological education kit costing $20, aimed at primary producers. It is one of the tools which the DPIE has produced to fulfil its obligation towards farmers (as a result of the 1992 Act) in the short-term, and to bridge the communication gap between farmers and the DPIE in the long-term.

> The project was initiated under the new National Drought Policy at that time, around 1993 ... under the education and communication component. The idea

> was initiated in the National Climate Centre, and a proposal forwarded to DPIE. They funded it and contracted us (Bureau of Meteorology) to produce it for them. (Mary Voice, Bureau of Meteorology, email 3 June, 1997).

Farming a Sunburnt Country is a mixed media package which contains a 35-minute introductory video, a small text book and several pamphlets. The materials cover five areas:

- Explanation of climate concepts and record keeping
- Case studies
- Climate records and record sheets
- Sources of climate information
- Advertising for climate analysis tools

Purpose of the Study

This study seeks to determine how farmers acquire scientific information. It will then place this knowledge within a communication framework that may be used to produce better communication packages and strategies.

Rationale for the Study

Under the 1992 National Drought Policy, the government is obliged to assist farmers to become self-reliant in managing farms in a variable climate. One means is through education. To understand how to develop appropriate communication strategies, however, it is necessary to understand how farmers find out about and understand climate information.

At present, little research has been done on how farmers understand a scientific issue such as El Niño — their perception of the problem, how they seek information, how they interpret this information or how they act upon it. Furthermore, the effectiveness of mixed media packages in communicating scientific information is unknown.

Research Questions

From an understanding of the problem and a review of the literature in Chapter 2, the following research questions have evolved;

- How do farmers acquire scientific information?
- In what ways is *Farming a Sunburnt Country* successful?

The research questions have necessitated a qualitative approach to data collection and analysis. In *Chapter 3: Methodology,* I discuss the theory underlying the techniques that have been used to collect and analyse data relevant to answering the research questions. I explore a constructivist approach, which assumes that a mode of communication appropriate to one person may not be appropriate to another, since people construct knowledge individually and contextually. It is this individual knowledge that is at the heart of the research problem.

In seeking to elucidate this individual knowledge, I conducted interviews with six farmers who have bought *Farming a Sunburnt Country.* I asked questions which would elicit their perceptions of who they are, how they view the issue of El Niño, what meteorological information they have sought and how they have acted on it. I also interviewed three people at the DPIE about their objectives and process in creating the information kit *Farming a Sunburnt Country.*

I have conducted the interviews using an open, interactionist (Silverman, 1993) and active (Holstein & Gubrium, 1995) interview method. I therefore set the context of the interview by stating my background and objectives.

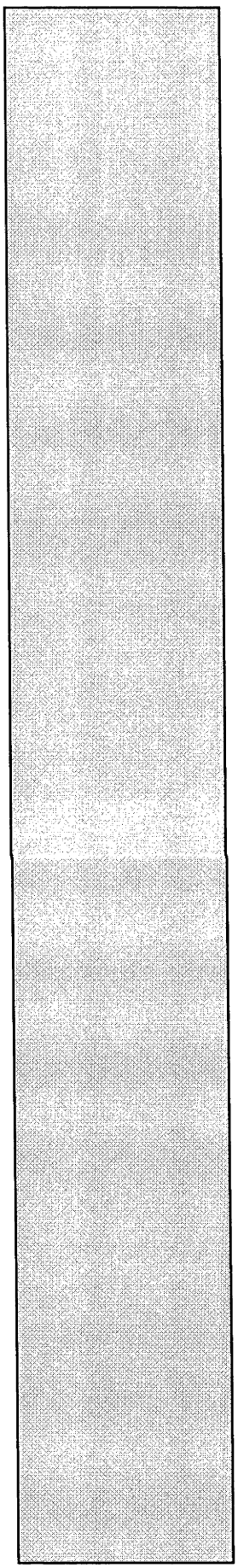
I designed interviews which sought to evaluate the effectiveness of *Farming a Sunburnt Country* as a communication tool. As I began to analyse the interviews, however, I realised the interview data enabled a broader discussion on how farmers approach a scientific issue. In *Chapter 4: Results,* I discuss how the answers the farmers were giving me were not always about the kit. Rather, their responses revealed how they perceive the whole context in which the kit had meaning for them. For some of the farmers, they would be talking about another topic, even though they were aware

that I was inquiring about the kit. This suggested that the "something else" was more important to them in their perception of the scientific issue.

In light of the wealth and scope of information I was getting from the farmers, the research question evolved from evaluating the kit as a communications tool to the broader communication issue of how farmers acquire scientific information. I have thus treated the kit and the questions I asked about it as a springboard for understanding this broader context. Finally, in *Chapter 5: Conclusions*, I answer the research questions and discuss emerging communication trends, giving suggestions of how to facilitate the acquisition of scientific information by farmers and how to improve mixed media education packages. I also discuss limitations in the study and recommendations for further research.

Chapter 2:

Literature Review



How do farmers acquire scientific information?

Does the problem really exist?

In recent years government advisory bodies and agricultural industries have been behind a push to increase the amount of scientific information available to farmers. The aim of this is to encourage farmers to learn new methods and use new technologies. Industry reports, however, express dissatisfaction at the rate at which new technology is being adopted and state that farmers are unaware of much of the existing and available information. Despite this, there is very little published information on how farmers respond to this deluge of information. In a report titled *How farmers learn?* Daniels and Chamala (1989) states:

> To blame farmers for not readily seeking and accepting scientific facts demonstrates a naive understanding of the way adults learn. The responsibility for improving communication within the agricultural community rests squarely with the people who feel they have something to contribute, but involves everyone in the agricultural community. (p.ii)

Unfortunately, attempts to expand communication activities by agricultural advisers have often used methods based on outmoded theories of communication. When research into improving communication has occurred, it has focussed on increasing adoption rates. The underlying belief is that studying "information exchange processes" will enable more efficient targeting of farmers, and more effective methods of communication.

While industry may be applauded for taking this step, studies of information exchange processes appear to focus on the effectiveness of various media at getting a message across. As identified by Daniels and Chamala (1989), this is in contrast to focusing on farmers and their needs.

> A new challenge, essential for efficient research and extension practice, is to develop appropriate techniques to obtain information from the farming

> community. Extension needs its own "market research". Extension officers presently lack the skills to conduct this research. (p.ii)

In order to understand how the needs of farmers might be examined, it is necessary to refer to the principles of communication theory.

Communication Theory

Traditionally, communication has been studied and understood according to the medium in which the information is transmitted. At one end of the spectrum lies face to face communication, and on the other, mass media. Personal, or "face to face" communication, being the oldest form of communication, might be expected to be the best and most reliable. The long experience humans have had at producing and interpreting these types of signals — verbal and visual — enables a depth of meaning not possible through other means. While this depth of meaning may assist in communication, however, it also increases the potential for misunderstanding.

In the modern world, it is not feasible to communicate personally all the time. Thus, mass media, which enable communication between many people spatially and temporally, are necessary methods of communication. It is widely recognised that with mass media, audience specificity declines and this in turn has encouraged the view of information as a commodity.

The medium, however, is only one element of the communication process which also includes "who", "what" and "how". A modern look at communication recognises that the sharing of meaning is fundamental to the communication process. In order to achieve this common understanding, the literature reveals a shift from the view that information has independent meaning, towards one of viewing it as a social construction. From this perceptive, Abel (1996) has identified that differences in how one perceives the world, and therefore constructs meaning, could become barriers to communication.

> In the ongoing process of communication, these kinds of barriers cannot be bridged by more glossy publications, they must be addressed by some kind of bridge in the understanding of another person's model. (p.16)

Building these bridges does not necessitate a change in one's beliefs or attitudes. Rather, it requires an understanding of the differences in the way other people perceive and process information, and therefore the different priorities they may assign to it. To assist in understanding these differences in world view, Berridge (1997, p.31) has outlined six strategies.

1. The audience must be clearly defined and a communication strategy tailored to their needs
2. Social and economic climate must be analysed
3. Material designed for the communication strategy should be pre-tested
4. Market research should be employed and information packages developed
5. Pilot studies of the innovation should be attempted, including the extent to which its effects are observable
6. Existing communication networks and reference groups should be identified

These strategies support the view that the needs of audience must be determined, in order to communicate effectively. They reveal a desire to maximise shared meaning, in order to minimise misunderstanding. They also mark a change from "top down" to participatory or conversational methods of communication which involve a two-way flow of information. In order to achieve two-way information flow, constant dialogue with the other party is required. Evaluation is an important aspect of this two-way flow, as it allows the audience to have some input into the design and running of the communication program. Evaluation is only valuable, however, where those being evaluated are open to constructive criticism and act upon it.

From a basic understanding of communication theory it would be expected that any message will be interpreted differently, by different people. In the next section I discuss the way in which science as a topic may influence the communication process.

Science Communication

There are some special considerations which need to be addressed by those wishing to communicate scientific information to the lay person. For example, phenomena described by science are often "invisible" or obscure — spatially and or temporally. Compounding this is the highly specialised nature of science and its seeming lack of relevance to everyday life. Science also has an image problem. Media often depict science as unsexy — typified by lab coat wearing, bespectacled "mad" scientists. This reinforces the bad experiences of science people have commonly had at school.

With these challenges in mind, two key approaches have been developed which underpin theories on the communication of science. One approach is to increase public understanding of science, while the other attempts to increase public awareness of science. In attempting to increase understanding, communicators of science believe that a population more proficient at science will overcome communication barriers. In order to do so, communicators need to determine what facts the public currently knows, in order to determine what facts they should be taught next. The philosophy guiding "public understanding of science" is characterised by science as a formal process, with experts who are privileged holders of objective knowledge (eg. Hendry, 1994, p.41; Glanville, 1995, p.18). This view is criticised for being arrogant, assuming that non-experts have no understanding of science, and for excluding "other" forms of science.

Communicators who approach science communication from a "public awareness of science" perspective differ by taking a constructivist philosophy. Constructivists consider knowledge to exist only within the minds of people, and that new knowledge is created subject to previous knowledge (Hendry, 1994, p. 41). That is, learning is contextual and teaching is a process of facilitating and negotiating. (Glanville, 1995, p. 18) By improving awareness of science, the communicator believes that people will be more likely to understand the world view of science and thereby decrease potential communication barriers. In the next section I discuss learning theories to gain insight into how best to communicate scientific information.

Models of learning

In this study, learning is defined as a change in a person's conceptual model of the world. A contemporary examination of communication theory suggests that a constructivist philosophy would be most appropriate for communicating and teaching scientific information. This, however, has not always been the case.

Linear transfer

Linear transfer models of learning are based on a pedagogical approach. Pedagogy means "to lead children" and is characterised by a transmission model of knowledge. This top-down approach has clear parallels with linear transfer models of communication. The transmission of scientific knowledge and technology from experts to farmers, called "agricultural extension", has traditionally been based on a linear transfer model of learning.

> The [linear transfer] model can have some success when dealing with a single crop or agrochemical, but is not regarded as successful for all types of technology, particularly those dealing with sustainability. (Berridge, 1997, p.24)

Ison (1992, p.365) and Vanclay and Lawrence (1995, p.110) have also recorded a similar opinion. It is clear then that a linear transfer approach to teaching complicated and non-predictable issues, such as climate change and farm management, will be inadequate.

Constructivism

Constructivist learning has its basis in andragogy. Andragogy means "to help adults learn" (albeit using a non-sexist translation). Constructivist learning de-emphasises transmission in favour of a conversation model of learning. In contrast to the pedagogical view, adults are assumed to have:

- A more independent self concept
- Wealth of prior experience
- Need to know
- Emphasis on problem solving

(Knowles, 1970, p.55)

Models such as constructivism have been developed in order to deal with some of the problems inherent in the transmission model of learning. In recent years, participatory extension methods such as Rapid Rural Appraisal, Participatory Resource Management, Farmer First and Landcare have proliferated. Each of these methods has a constructivist basis, and takes into account one or more of the factors identified by Knowles (1970).

Situated Cognition

If one takes a constructivist approach to learning and regards farmers as independent learners who have a wealth of prior experience, then the context of the farmer becomes relevant. Situated cognition is the term used for learning that occurs specific and relevant to a particular situation. The key characteristics of situated cognition are:

- Meaning is constructed in the mind of the learner.
- The learner applies new knowledge within the context of their own present situation.
- Meaning is modified or accepted by prior experience.

On situated cognition, Yager (1991) states that:

> ... from this perspective, learning outcomes do not depend on what the teacher presents. Rather they are an interactive result of what information is encountered, and how the student processes it based on perceived notions and existing personal knowledge.

Daniels and Chamala (1989) supports the relevance of this view for farmers, emphasising that it is how farmers interpret information — its importance, relevance and meaning — which influences their learning, and not how extension officers provide it or the importance the officer attaches to it.

If, in accordance to the principles of situated cognition, it is assumed that the learner applies new knowledge within the context of their present situation, then it is important to have an understanding of that context. Currie (1997, pp. 2–12) has identified several

factors which should be addressed in trying to understand the adult learner's context — age, gender, language, educational level, prior knowledge, previous experience, past achievement in formal education, literacy, intellectual development and cognitive styles. These should be examined within the greater context of cultural, economic, political and social factors.

The scope of these factors suggests that there will be a great diversity of audiences. In taking into account just some of these characteristics when preparing information, it becomes clear that one must remember there is no one way to teach adults effectively, but rather a range of successful ways. It is also important to remember that there will be a range of ways in which adults will seek out information and interpret it.

In addition to the subjectivity in how information is interpreted, it should also be noted that the resulting understanding of an individual may contradict previous reasoning. Contradictory understanding can occur due to the specific context in which learning occurs. Therefore, what seems sensible in one situation may, in a different situation, seem nonsensical, despite there being no "real" difference in the facts of a situation.

From a study of communication theories and models of learning, it would be expected that communication approached from a constructivist theoretical background would be the most effective method of communicating science. Before undertaking any learning, however, a person must choose to learn. The factors that determine how this choice is made are discussed in the next section.

Reasons adults learn

Merriam and Caffarella (1991) have identified, from a sociological perspective, 6 factors that influence why adults participate in learning activities:

- Professional advancement
- Social relationships
- External expectations
- Social welfare

- Escape and stimulation
- Cognitive interest

While they found that professional advancement is the major motivation for learning, stimulation, external expectations and the social environment can also play a significant motivational role. Merriam and Caffarella (1991) have also determined major factors which explain why adults do *not* participate in learning activities:

- Not enough time
- Unaware that educational activities are available
- Individual and personal problems
- Against social norms to participate
- Negative feelings about institution or educational activity
- Education not valued

They suggest that lack of time and lack of awareness of the educational activities are the main reasons for not participating. Next in importance was undervaluing of education, followed by the other factors. In a farming context, these barriers certainly exist, the most significant being the initial, apparent lack of relevance of the topics and lack of time.

Perception of a problem

Gagne (1977) has made a fundamental contribution towards understanding what motivates somebody to change their conceptual model of the world. He has identified an event that occurs before the decision to participate in learning. Gagne's view is that it is only when a person perceives a problem, or is dissatisfied with, their current conceptual model that they will begin to change it — will want to learn.

If this is the case, then even if all the factors identified by Merriam and Caffarella (1991) are accounted for, it will be ineffectual to try to force farmers to learn if they do not perceive a problem. This view is strongly supported by Daniels and Chamala (1989).

> Learning is a cyclical process with a persons' perception of need (desire) to learn about a topic influencing the way they go about learning (process) which influences the likely outcome of learning (understanding). (p.2)

From an understanding of Gagne's theory, it would be expected that by demonstrating clearly to farmers how, for example, it is important and relevant for them to learn about El Niño, this would motivate them to learn. Having motivated farmers, and providing that there are no other barriers to learning, it would be expected that farmers would seek out information appropriate to their needs and compatible with previous experience and expectations.

Very often the aim of motivating people to learn about a subject is to encourage them to change not only their conception of the world, but behaviour too. In this case, the DPIE is hoping that in learning more about El Niño and climate variability through their kit, farmers will change their farm management style to become less vulnerable to climate change, and less reliant on the government for support. In the next section I look at factors that mediate and influence behaviour change.

Behaviour change

A basic model for behaviour change outlined by Vanclay and Lawrence (1995, p. 76) is described as, "attitude mediating the influence of an external stimulus on an individual's response to that stimulus." This is summarised in Figure 1.

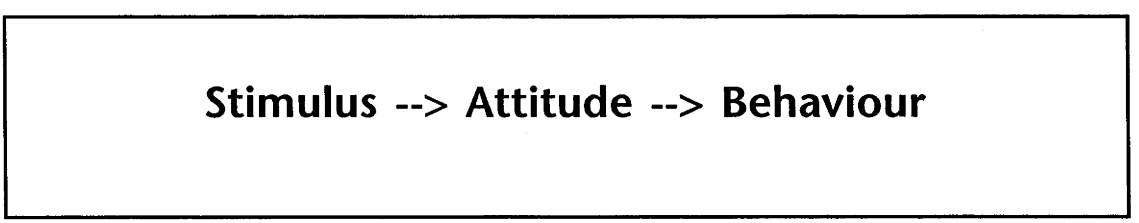


Figure 1. Model for behaviour change (after Vanclay and Lawrence, 1995)

Therefore, in order to elicit a desired response — increased conservation farming — both an appropriate attitude and stimulus is required. Many studies show farmers to

have a very well developed land conservation ethic, (eg. Vanclay and Lawrence 1995) indicating that an appropriate attitude already exists. The desired response is not seen, however, suggesting that an appropriate stimulus is lacking. While surveys show that farmers recognise land degradation as a problem and that it occurs in their region, they also reveal that farmers do not believe it occurs on their own land. Vanclay and Lawrence (1995) suggest that if farmers developed the skills to recognise land degradation on their own land, then this would interact with their strong land ethic to motivate the farmers to learn about and utilise climate information and climate agencies. Thus, the stimulus in this context is recognition by farmers that land degradation occurs on their own property.

Typically, however, education programs aim to change attitudes rather than awareness. This was demonstrated in an Education Research and Development Committee report (Salmon, 1981) that outlined five years of research which sought to develop a "technique in developing *attitude change*, as a basic prerequisite in adult education", in particular farm management education. Vanclay and Lawrence (1995) suggest that this focus on attitude rather than stimulus, as a precursor to behaviour change, is misguided and allows governments to apportion blame and responsibility upon the farmers for land degradation. Aside from the reasons outlined above, a more complex understanding of behaviour change, which includes Gagne's theory, would recognise that other factors, including financial, time and government policy pressures, may override any desire to act. Even considering these other factors, decision making can not be viewed as a strictly logical calculation of risks and benefits.

Given the myriad of overlapping considerations, it would appear that a knowledge of a person's reasons for a given decision will be more illuminating than merely evaluating the outcomes, especially when it is considered that different reasons may result in the same outcome, or the same reason may result in different outcomes for different people. For example, while two people may want to seek climate information, they may do so for completely different reasons. In the next section I will discuss farmers as a particular group in light of the previous literature on communication, learning and behaviour change.

How farmers learn

Carr (1995) surveyed Landcare groups — composed of farmers and other community members — confirming the relevance of communication and learning theories previously discussed. Carr also outlined the context of shifts in communication theory — from viewing data and information as commodities, towards viewing them as socially constructed knowledge. This shift confirms the move away from linear transfer models, towards constructivism in agricultural extension.

In a report titled *How farmers learn,* Daniels and Chamala (1989) found that the understanding of the topics by farmers in his study was very poor. In clear support of Gagne's theory, he suggests this is not because they lack intelligence, but because they often did not see any need to learn it. He further found that the style of presentation may have altered the farmer's perception of need to learn.

Level of education also influences desire to learn. Daniels and Chamala (1989) found that better educated farmers are more interested in learning facts and procedures than farmers with fewer years of formal education. The differences between gender roles also influences desire to learn. Alston (1995) has noted that women are often a hidden but influential demographic in farming communities. 53% of women she interviewed were solely responsible for bookkeeping and a further 11% shared the task with their husbands (p.92). Furthermore, 58% of women had higher qualifications than their husbands. There is an obvious link between higher education and their role in bookkeeping. It would therefore also be expected that women would be the primary seekers of information. Alston found, however, that information seeking is predominantly a male task — only 37% of women involved themselves to some degree (p.44). This suggests that Daniels and Chamala (1989) findings are specific to male farmers.

Relevant to theories on situated cognition, Daniels and Chamala (1989) found that younger, better educated farmers with relatively less experience are more likely to seek and accept new information. Older, less educated farmers with more experience farming are more likely to attempt to relate the facts to their existing knowledge. The more experienced farmers become, the less likely they are passively to accept

information in the form of recipes. Experienced farmers interpret new knowledge as it relates to their existing knowledge

In taking these factors into consideration, extension officers have to properly identify their target audience. Further complicating this is that farmers are prepared to rely on the advice of others and avoid learning themselves (Daniels and Chamala, 1989, p.5). For example, agricultural merchants play an influential role as intermediaries between extension officers and farmers. Merchants often change the form of knowledge as appropriate to their (commercial) needs (Anderson, 1982).

Finally, farmers have been thought of as a relatively homogeneous group, with their own social norms which by and large exclude such values as education and training (Salmon, 1981). More recently, however, there has been a recognition that farming subcultures exist (Vanclay and Lawrence, 1995) and that the farming community is diverse and heterogeneous. Furthermore, even within these subcultures there will be different farmers with different needs. For example, Anderson (1982) suggests that face to face extension — dominated by the "progressive farmer" — will not reach farmers outside the progressive farmer's social circles, and therefore needs to broaden its range of clients. Thus, a single extension program will be inadequate and multiple styles of presentation are necessary. (Daniels and Chamala, 1989; Vanclay and Lawrence, 1995).

Summary

Farmers have a plethora of scientific information available to assist them in better managing their farms. Industry has commented, however, on the lack of uptake and acceptance of this information by farmers. The literature indicates that the scientific nature of the information means that farmers are unlikely to see the issue as relevant to them and therefore will not be motivated to seek out information on it. Even with topics in which farmers were motivated to learn, differences in learning styles were predicted to affect the way in which information was used and comprehended. Furthermore, behaviour change theories revealed that in attempting to alter the behaviour of farmers, the attitudes of farmers were often inappropriately targeted.

In what ways is *Farming a Sunburnt Country* successful?

Introduction

Mixed media packages contain information that is presented on more than one medium. For example television is mixed media, as is a magazine that contains a computer disc. Multi media has the same meaning as mixed media, but has come to refer to computer based mixed media, typically CD-ROMs. *Farming a Sunburnt Country* is a mixed media package which contains a 20 minute introductory video, a mini text book and several pamphlets. It is a general meteorological education kit costing $20. It is aimed at primary producers and contains materials that cover 5 areas:

- Explanation of climate concepts and record keeping
- Case studies
- Climate records and record sheets
- Sources of climate information
- Advertising for climate analysis tools

Table 1. Sources of weather information readily available to farmers.

Source	*Description*
The Land	Rural newspaper containing weather reports and analyses
Newspapers	Weather pages
TV	Weather forecast
Internet	Local forecasts, Bureau and DPIE site
Weather by Fax	Satellite by fax service provided by the Bureau
Seasonal Climate Outlook	Three monthly outlook provided by the Bureau
Don White	Climate consultant and contributor to *The Land*
Government agencies	DPIE, Department of Agriculture, Bureau.
Rainman, Grasfeed	Management software packages

While mixed media is being explored as a medium for communicating climate information to farmers, there are many different media used to do this. The sources of information listed in Table 1 are available to farmers to assist them in understanding

climate conditions and how they might affect farm management. Most of these are single media, while some are mixed or multimedia.

The merits of mixed media as a communication tool will be discussed in the next section.

Mixed media as a communication tool

Mixed media, especially in its current form on computers, has enormous potential for engaging the audience and providing a rich and interactive mode of communication. Mixed media appears to be able to cater for many of the aims in andragogical methods. Mixed media also appears to offer ways of tackling some of the challenges previously outlined relating to science communication. For example, mixed media is a new and exciting format which may remove some of the stigma associated with science. It can also make visible, the invisible, through illustrations and animations.

While there has been much hype surrounding the potential for mixed media, a study by Lowe (1996) scrutinises some of the assumptions made about mixed media:

1. More information is better than less
2. Free exploration is better than an imposed pathway
3. Some modes of information are intrinsically easier to understand
4. The more media the better
5. Production ease for non-media specialists means communication effectiveness
6. Impact is the main component of effective communication
7. More interactivity necessarily means better communication

Lowe (1996) argues that these assumptions are not necessarily valid in all situations or for all people. He makes a plea for content and method over technology, and cautions against a complete swing to andragogy.

Does the problem really exist?

Mixed media is a relatively recent phenomenon and, as indicated by Lowe (1996), the issues surrounding its use as a communication tool have not been properly studied. A search of the literature found only three studies specifically on mixed media or mixed mode education (not computer) packages as communications tools. Two were commissioned by Department of Education Employment and Training and evaluate attitudes towards and cost effectiveness of mixed mode approaches compared with conventional face to face methods. One study targets industry training (Taylor, Kemp and Burgess, 1993) while the other looks at higher education (Taylor & White, 1991).

They are limited in their application to this study because at a fundamental level, industry training and higher education are both different from voluntary, non-accredited adult education. Furthermore, the studies by Taylor et al. (1993), and Taylor & White (1991) have taken an attitude-based approach to understanding the effectiveness of the product. Current literature reveals this to be an inappropriate approach as stimulus, or perception of a problem, rather than attitude is the key to understanding learning outcomes.

The lack of research done in the area is confirmed by the third study by Kozma quoted in McMillan, (1993, p.60). Kozma suggests that this is because "few integrated packages actually exist". While there is a proliferation of such packages today, no further published research was found.

> There is a lack of research and evaluation studies of extension approaches and information delivery mechanisms as they relate to stages of the problem solving process beyond initial awareness. (LWRRDC, 1993)

It is interesting to note that by using the term "delivery mechanism", the Land and Water Resources Research and Development Corporation (LWRRDC), as a major advisory body, reveals a tacit acceptance of the linear transfer paradigm of extension. More important, people in the extension industry are saying that there is a need for appropriate communication tools that target the right audience. Little research has been done, however, on the effectiveness of mixed media as a communication tool. From the review of communication theories, it is clear that evaluation is a critical component

in ensuring the relevance and appropriateness of communication, regardless of the medium. In the next section I will explore factors relevant to evaluating mixed media as a communication tool.

Evaluation of communication tools

Evaluation is crucial in ensuring the effectiveness of any information exchange process. Evaluation cannot be merely outcome driven, however, as this evaluates only the learning of the recipients. While such criterion-based evaluation will be of value to program designers who are interested in finding out whether participants learnt what was intended, in some respects what the program designers wanted the participants to take away from the course is irrelevant. Instead, it is what the participants found they got out of the course that is important. The audience is much more likely to take an interest in communication activities if the information is perceived as relevant, non-confrontational and useful. Evaluation must therefore also enable assessment of what the participant considered to be important and successful. This may result in the revelation of unexpected outcomes.

Nevertheless, it cannot be denied that program designers may have valid information for other parties. While not denying a place for externally decided objectives, they may only come to fruition if the intended audience shares these objectives. To facilitate a sharing of objectives, formative evaluation — which occurs prior and during product development — is necessary. Worsley and Hartley (1994) very clearly identify the need for software development for farmers to involve farmer consultation and participation.

> It seems much of the software for farmers has been developed according to researchers' perceptions of the farmers' requirements. As such, many packages do not address farmers needs. In order for farm software to be successful, farmers must be involved at all stages of development, from the early planning stages through to evaluation. (p. 31)

Despite the theory on evaluation, little evaluation of programs seems to occur. Evaluation that does occur appears for the most part to be informal. This is especially common in the field of education where a plethora of new materials is available every

year. In such cases literary reviews in educational journals and publications, in addition to news along the "grapevine" is the primary method of evaluation. (Highland, pers. comm., 1997) As a final word of warning to potential information providers, Daniels and Chamala (1989, p.7) said, "it must be remembered that even before scientific research existed to be communicated, farmers were making decisions."

The literature stresses the importance of evaluation. Thus far, however, only evaluation of content has been considered. In the next section the merits of video in mixed media will be discussed.

Evaluation of video in mixed media

One of the features of *Farming a Sunburnt Country* is the video. Videos are associated with entertainment and thus have a positive association for many people. The distinction between video as entertainment and education or "eduvideo" was investigated by McMillan (1993). In a Master's thesis on the use of video in a distance education kit for horticulture students, he asks the question, "is video just a frill designed to attract people, or can it actually have some educational value?"

Broadly speaking, a video can take on both roles, neither of which is necessarily more important than the other. If the package as a whole is made more accessible due to the inclusion of a video, then the video as a "frill" is crucial to the package as an education tool. In asking the question "will improved understanding of the video medium, and of learning theories, increase the educational value of video?", however, McMillan (1993, p. 114) has outlined the following questions to assist best eduvideo practice:

1. Is the video flexible enough to suit different students?
2. Does it allow segmented learning?
3. Does the video have significant content compared to the other media?
4. Are the aims of the video clear?
5. Is use of the video clear?

In keeping with theories on situated cognition, McMillan assumes that different media affect learning either directly, through constraints on teaching method, or indirectly though factors such as motivation and perception of technique. Due to the potentially linear and passive nature in which people have come to view entertainment videos, issues of flexibility, pace and dialogue are of particular concern when including video in an educational setting. In addition, the literature inconclusively debates whether different media within a package should reinforce other media through repetition, or extend other media through additional materials.

Summary

Mixed media has great potential as a rich and flexible means of providing educational information. As yet, very little published research has been done on how this potential may be best exploited. Furthermore, there has been little evaluation of materials that have been produced. Evaluation is a vital component of the production stage as, properly conducted, it will give insight into how and what the audience wishes to learn. Mixed media packages that contain video are challenged by the common view of videos as easy entertainment. This perception is not the only hindrance to using video in learning. The video medium may itself prove to be too inflexible, linear and costly to update.

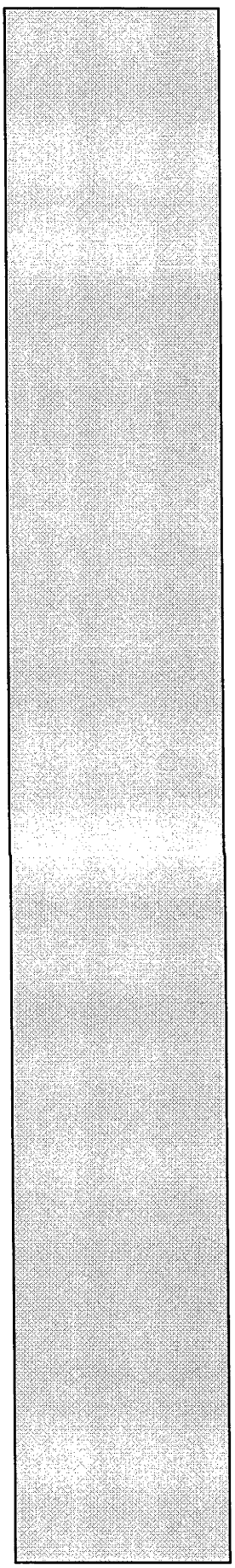
Summary of chapter

Farmers have a plethora of scientific information available to assist them in better managing their farms. Mixed media are a relatively new format being used by advisory bodies to increase the acceptance and uptake of this information by farmers. Mixed media, however, do not necessarily make scientific information more relevant to farmers and may therefore be ignored. Furthermore, unless the needs of farmers are incorporated into the production of mixed media packages, it would be expected that the learning styles of farmers would not be catered for and therefore, such packages would be unlikely to result in any significant behaviour change.

In *Chapter 3: Methodology*, I discuss theories relating to the design of the research.

Chapter 3:

Methodology



Introduction

In order to answer the research question — in what ways is *Farming a Sunburnt Country* successful? — I interviewed six farmers to ask them their opinions of the kit. I also interviewed some people from the DPIE who were involved with the production and marketing of the kit.

After reviewing the interviews, I realised that the farmers were providing me with information that went further than just an evaluation of the kit and in fact revealed to me how they seek information on a technical farming issue. As a result, a further research question evolved — how do farmers acquire scientific information? This was addressed from the interview data collected from the first research question.

The theoretical background to my choice of data collection, study group and data analysis is discussed in this chapter.

Data collection

Why interview?

Data collection has often been divided into qualitative and quantitative methods which parallel the objective/subjective dichotomy seen in communication and learning theories. Qualitative research has a very clear and recognised role in social research today as it is the only way to gain insight into other peoples' thoughts, memories, perception and emotions. Interviewing as a method of qualitative data collection is standard practice in social research (Holstein and Gubrium, 1995, Marshall & Rossman, 1995, Silverman 1994). It is used as a way of understanding how individuals make sense of their social world and act within it (May, 1997, p. 129).

My research questions dictated that I use qualitative methods. In determining how individual farmers acquire scientific information, I could not obtain objective facts. Instead, it is what motivates people to seek scientific information, how they interpret and act upon it, as well as the physical act of getting the scientific information that was

of interest in this study. Short of actually living with the farmers — participant observation — in-depth interviews are recognised to best provide the type of data required.

What makes a good interview?

Having chosen interviews as my means of collecting data, a review of how to conduct a successful interview was appropriate. Consistent with a constructivist philosophy, in-depth interviews can be described as a *conversation* with a purpose. Fundamental to qualitative research, including interviews, is that the researcher explores a few general topics to help uncover the participant's perspective, but otherwise respects how the participant frames and structures the responses (Marshall & Rossman, 1995, p.80).

Interviews range from structured to unstructured in style. Structured interviews are grounded in positivism where objective and comparable facts are sought, whereas, unstructured interviews place importance on the social construction of the interview itself. While some research attempts to obtain objective facts and thereby remove interviewer bias, Silverman (1993, p. 96), points out that this is based on the belief that the interview is able to be conducted as though the context of the interview, and the relationship with the interviewee, can be removed. From a constructivist perspective, however, it is clear that an interviewer does not seek to obtain objective facts, rather, the interviewer recognises that the context and interviewer's perspective are an integral part of the interview process.

In recognising the full extent of the interaction — an interview is conducted in a particular environment which will elicit certain knowledge which is socially constructed within that environment (Holstein and Gubrium, 1995, p.3) — I conducted semi-structured interviews. These combine comparability of data with the ability to focus on the interviewee's concerns while acknowledging the situated context of the interview in constructing meaning.

Maintaining rapport is crucial in any interview where the context is considered to be important to the process. The interviews were therefore conducted in the environment that the respondent chose. The respondents were told that I sought their opinion and that

there were no right or wrong answers. While I was open to changes in direction of the conservation I ensured that key questions were answered.

"Interviewers should have superb listening skills and be skilful at personal interaction, question framing and gentle probing for elaboration." (Marshall & Rossman, 1995) By using a tape-recorder I sought to concentrate on the interview process — personal interaction, question framing and gentle probing — rather than note-taking. Since tape-recorders can be intimidating, the interviewees were asked for permission to tape. Any negative effects from recording were further minimised by being freed up to facilitate a more conversational style of interview. Recording the interviews enabled me accurately to transcribe any information that was said by the interviewees. I recognised at all stages that the process was subjective and that I was creating meaning from the way in which I collected the data and the way I chose to conduct the study.

"The most important aspect of the interviewer's approach concerns conveying an attitude of acceptance." (Marshall & Rossman, 1995). To convey an attitude of acceptance the interviewees were encouraged to feel that their responses were valuable and useful. To provide suitable context for the interview, the respondents were told that the interview would assist me in completing a Master of Science (Scientific Communication) at the Centre for Public Awareness of Science at The Australian National University. They were also informed that I was interested in understanding the effectiveness of mixed media education kits, such as *Farming a Sunburnt Country,* and was conducting an independent evaluation. Finally, the respondents were told that I was soliciting their opinions which may be used to improve *Farming a Sunburnt Country* or other such kits.

The interviews lasted about one hour, although depending on the circumstances were longer or shorter. I was limited to one interview with each farmer.

Triangulation

Pivotal to optimising the quality of data collected is the concept of triangulation. Triangulation is defined as the use of multiple methods, data sources and researchers to

improve the reliability of research findings (Mathison, 1988, p.13). Denzin (1978, pp.294–307) outlines three useful types of triangulation:

1. Data triangulation including time, space and person
2. Investigator triangulation
3. Methodological triangulation

Contrary to some researchers, Mathison (1988) argues that triangulation is not about reducing bias or improving validity as this is based upon two invalid assumptions: One, that multiple sources will converge, and two, that multiple methods will negate bias. The invalidity of the first assumption is consistent with the casual observation of the inability of large groups to form a consensus. Furthermore, the invalidity of the second assumption is consistent with a constructivist perspective, in which multiple methods may produce divergent data due to the different contexts and therefore will not necessarily negate bias.

Mathison proposes an alternative conception of triangulation where inconsistency and divergent results are accepted, and the diversity and richness of meaning is teased from this, without trying to find a single proposition. Thus triangulation is not a "technological solution to a data collection and analysis problem, it is a technique which provides more and better evidence from which researchers can construct meaningful propositions about the social world" (p.15).

While a pseudo-quantitative approach might seek to interview as many people as possible to obtain convergence or consensus of data, based on Mathison's (1988) conception of triangulation this is not a valid approach to qualitative data collection. Sless (pers. comm. 1997) supports this and believes that six in-depth interviews is sufficient to gain a useful understanding of a given situation. On these grounds I chose to conduct six interviews. Other forms of triangulation were not conducted in this study.

How were the farmers chosen?

I contacted the DPIE who had a list of all the people who had bought the kit. For ethical reasons, the DPIE contacted these people on my behalf, and asked them if they would be willing to be contacted by me, with the intention that I would talk to them about the kit. The people who agreed are listed in Table 2.

Table 2. Numbers and places of people contacted by the DPIE regarding the study.

Region	*Accept*	*Reject*	*Type*	*Interviewed*
ACT	3	0	Government	0
Goulburn / Boorowa	2	1	Individual	2
Mudgee	1	1	Individual	0
Forbes	3	0	Individual	2
Canowindra / Orange	3	0	Individual & school	1
South Coast	2	0	Individual & school	1 (Pilot)

The 14 people who had accepted were spread out over a wide region. I was able to exclude teachers and bureaucrats while still leaving six farmers to interview. Of the six, five live in the region north of Canberra and west of Sydney, while one lives on the coast at Nowra. I contacted each of them to organise a convenient meeting time. The farmer in Nowra was interviewed first as a trial run. This was appropriate as questions cannot be developed in isolation and needed to be trialed to determine whether they were providing suitable data. While this was an explicit point at which the method could change, refinement in the method occurred throughout the interview process and did not end after the interviews were completed. This was most clearly demonstrated by the change in study focus after beginning to analyse the data.

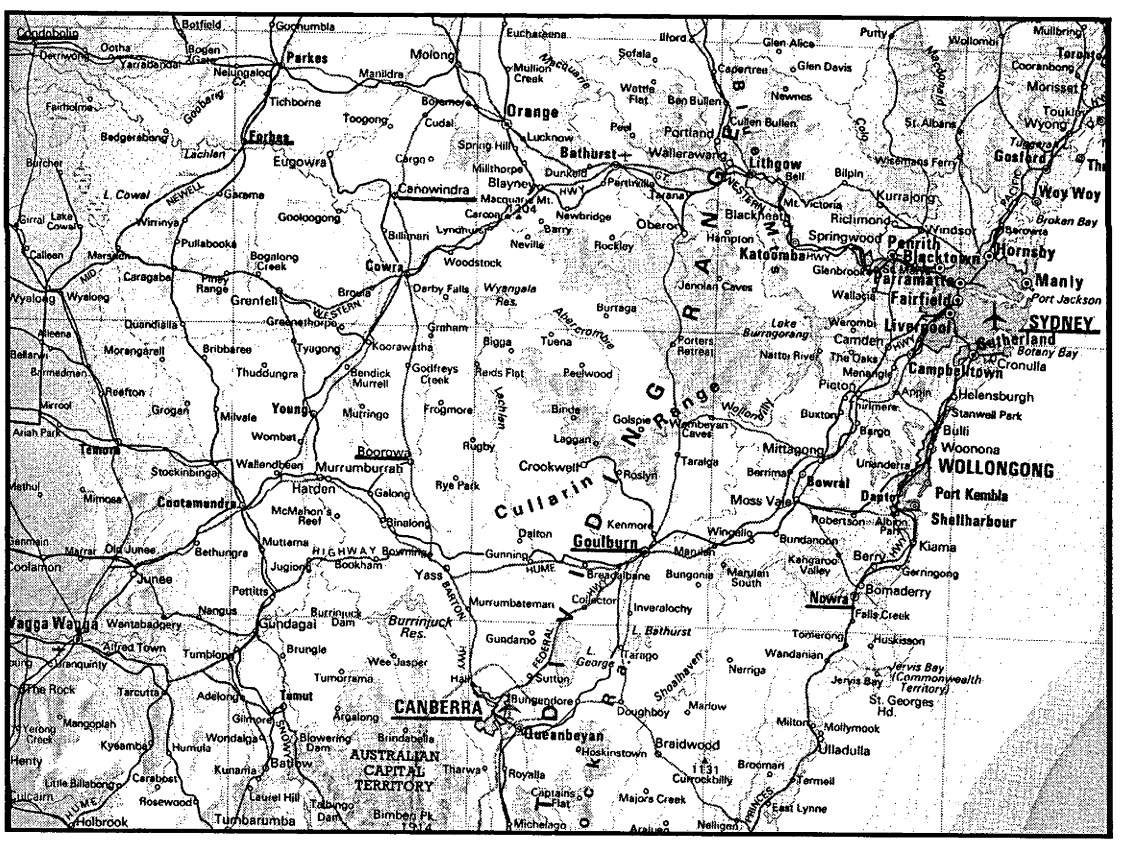
Conducting a trial interview also gave me practice at conducting interviews. The pilot farmer, located on the coast, was chosen to provide an alternative perspective which might highlight differences between inland and coastal farmers. The other five farmers were asked to make a meeting time within a one week period. During this time I visited and interviewed one to two farmers per day.

Where are they?

The locations of each of the farmers listed in Table 3 are marked on Figure 2. Pseudonyms have been used.

Table 3. Location of the farmers.

Farmer	*Location*
Adam Douglas	Nowra
Ben Davies	Goulburn
Colin Mullaney	Boorowa
David and Sonia Pike	Canowindra
Evan Bishop	Forbes
Fred Hardy	Forbes - Condoblin


Condobolin
Parkes
Molong
Orange
Forbes
Eugowra
Bathurst
Lithgow
Canowindra
Cowra
Grenfell
Young
Boorowa
Murrumburrah
Harden
Cootamundra
Goulburn
Crookwell
Yass
Gunning
Junee
Wagga Wagga
Tumut
CANBERRA
Queanbeyan
AUSTRALIAN CAPITAL TERRITORY
Braidwood
Ulladulla
Batemans Bay
Nowra
Bomaderry
Kiama
Shellharbour
Port Kembla
WOLLONGONG
Dapto
Bowral
Mittagong
Moss Vale
Berrima
Picton
Campbelltown
Liverpool
Fairfield
Parramatta
Blacktown
Penrith
Katoomba
Blackheath
Springwood
Richmond
Windsor
Gosford
Woy Woy
Hornsby
Manly
SYDNEY
Cronulla
Sutherland
Helensburgh
Bulli
Woonona
Albion Park
Berry
Gerringong
Huskisson
Jervis Bay
St. Georges Hd.
Milton
Mollymook
Batemans Bay
Moruya
Bega
Eden
Cooma
Jindabyne
Tumbarumba
Wagga Wagga
Gundagai
Tumut
Adelong
Tarcutta
Albury
Corowa
Deniliquin
Hay
Griffith
Leeton
Narrandera
Temora
Cootamundra
Junee
Wyalong
Lake Cowal
Forbes
Eugowra
Molong
Orange
Bathurst
Lithgow
Oberon
Katoomba
Blackheath
Springwood
Penrith
Blacktown
Parramatta
Fairfield
Liverpool
Campbelltown
Camden
Picton
Wollongong
Kiama
Nowra
Bomaderry
Moss Vale
Goulburn
Crookwell
Yass
Gunning
Boorowa
Young
Cowra
Canowindra
Grenfell
Forbes
Condobolin
Parkes

Having detailed how and who I interviewed, I will now discuss how the data was analysed.

Data analysis

As in data collection, data analysis can be viewed as a qualitative or quantitative process. In taking a qualitative approach to data collection, it was appropriate to take a qualitative approach to data analysis. As such, data analysis is seen as a subjective process of interpretation. "Analysis of materials requires more than linguistic analysis, as if speech were constructed in a hermetically sealed universe" (Bordieu, 1992 in May, 1997). In analysing the interview data an explanation of the position of the speaker, their social identity and motivations is therefore also required.

In analysing the interview data, it became apparent that the study scope could be significantly widened. This increase in scope is fully consistent with the view put forward by May (1997, p.125) that "the research aims and theoretical interests should be open to modification and be challenged by the interview data during analysis." An additional research question therefore, emerged — how do farmers acquire scientific information?

From the literature review and from an understanding of qualitative data analysis, I identified key issues to be addressed in *Chapter 4: Results*. Issues that arose out of the interview data were also developed. To facilitate this process, the interview transcripts were coded (to a limited degree) according to person and issue. The interviews with farmers were discussed with the following categories in mind:

1. Self
2. Perception of the issue
3. Learning style
4. Sources of information
5. Behaviour change

These categories were identified to tease out information relating to the farmers' perspective of themselves and issues relating to their acquisition of scientific information.

In discussing the role of the DPIE in producing the kit, the following categories were useful in analysis:

1. Objectives
2. Perception of the audience and self
3. Evaluation

The DPIE influenced how the kit was put together, its objectives and the context of its production and marketing. This enabled an analysis of whether the kit, as an example of one source of information, has been successful.

Time line

The following Table shows a time line for the study;

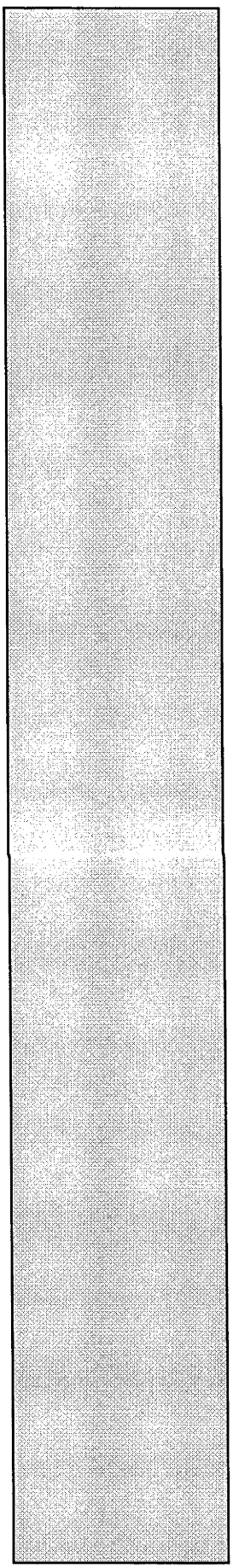
Table 4. Time line of events in the study

Event	*Date*
Discover the kit and formulate study	May 1997
Obtain list of people who have bought the kit and are willing to do an interview	July 1997
Survey government agency	August 1997
Contact respondents and make a time to interview	October 1997
Pilot interview (one farmer)	October 1997
Modify method	October 1997
Interview six farmers	November 1997
Analyse results	Jan–June 1998
Write up	July 1998

In *Chapter 4: Results*, I analyse the data by considering all the interviewees together, even though I acknowledge that farmers are not a homogeneous group. By highlighting the differences and similarities between the farmers I wish instead to draw out the important issues of communication.

Chapter 4:

Results



Introduction

This chapter is divided into two sections;

1. **Farmers** — The interviews with the farmers were analysed according to the categories outlined in *Chapter 3: Methods,* p.30, to provide material to answer the research questions; How do farmers acquire scientific information? In what ways is *Farming a Sunburnt Country* successful? These categories are:
   1. Self
   2. Perception of the issue
   3. Learning style
   4. Sources of information
   5. Behaviour change

2. **Department of Primary Industry and Energy** — The interview with people from the DPIE was analysed according to the categories outlined in *Chapter 3: Methods*, p.31, to provide another perspective in answering the research questions. These categories are:
   1. Objectives
   2. Perception of the audience and self
   3. Evaluation

Farmers

As planned, I contacted the pilot farmer and met with him before meeting with the other interviewees. I found that even though the pilot farmer lived on the coast in farming conditions that were different to the other farmers — flooding was more of a problem than drought — the comments that he made were consistent with the other interviewees. I will, therefore, discuss his interview together with the interviews of the other farmers.

To gain an understanding of my own perspective, I will discuss some of the aspects of my data collection trip which involved travelling by motorbike with interview materials (tape recorder, interview questions, and the kit) and lap top computer. In each case there was something about the way I arrived that seemed to set the scene for the rest of the interview.

Vignette: Adam, Nowra, 12/10/97

When I arrived Adam was sitting in the living room watching cricket on a large-screen television. He appeared surprised at my appearance, perhaps being young? perhaps Asian? perhaps ...? In some ways this was typical of my interviews. I got the impression, however, that rather than impacting negatively, my appearance and demeanour helped create rapport in the interviews. Some researchers have noted that farmers feel they are one of the most over researched group of people and are sick of being "experimented" on. Perhaps the unexpectedness of my appearance helped open up the interviews.

During the interview we sat on couches in the living room with the cricket turned down low. He spoke to me in a very personal manner. Adam's wife was in the kitchen during the interview and did not participate except to answer the odd question that Adam directed at her. The hidden but influential role of women suggested by Alston (1995) is echoed in the interviews with Adam and several of the other interviewees.

Self

Adam was typical of all the farmers I spoke to in that his main occupation was running cattle. The Pikes, however, are retiring and have established a bed and breakfast. All the interviewees were at least 40 years old, spoke English and were literate — having completed the equivalent of high school education. TAFE, workshops and field days were the most common form of further education. Supporting Alston's (1995) findings about the prominent role of males, men were the ones who had heard about

and decided to get the kit. Thus the interviews were dominated by male farmers because they are the primary information seekers. In some cases it was mentioned that the farmer's wife had been asked to buy the kit, confirming the role identified by Alston of farm women as "gophers and bookkeepers" (p.92). The interviewees revealed that they each felt they were better than other farmers at seeking information, realising its importance and acting upon it. It is uncertain whether this is because of their relatively high level of education, or because of the necessary belief in one's own abilities in a farming situation.

Farmers are pretty bloody dumb. (FH)

The current situation ... led a lot of farmers to panic ... I decided that I was going to act in a reasonably normal manner but with some reservations. (EB)

A more accurate or honest explanation may come from a "confession" from one respondent that dealing with an increasingly information based, rather than labour based, farming operation is difficult and overwhelming. While this is not surprising, because this frustration with "information overload" is reflected in the general population, it is especially difficult for farmers who must act on such information everyday. As such, farmers must believe they are able to seek and comprehend such information. It was clear that all the interviewees, despite their ability to gather information, actually experience some discomfort with the problem.

When confronting the source of this discomfort — government officials, extension officers, scientists and environmentalists — the interviewees' view of themselves in relation to other farmers became more inclusive. Considerable anger was shown towards these other groups, partly due to the impact they have upon farmers, but also because of the inability to communicate or find common ground.

I'm a bit sick of, particularly scientists, producing stuff with no facts or references, probably eight out of ten times exaggerating it to get funding. Sick to death of it. (FH)

Scientists in particular were described in stereotypical ways — laboratory bound, overly confident about their results, lacking in field experience or in understanding the situation

farmers are in. In fact, when talking about non-farmers, the interviewees tended to be defensive about themselves, revealing entrenched positions.

I've got a real derry on most of the environmentalists because they're a pack of bloody liars. (FH)

Farmers don't want to go to a scientist and feel as though they are a complete and utter ninny, and they aren't, but they can't express themselves very well. (DSP)

Vignette: Ben, 11/11/97

I met Ben at his home near Goulburn where he was in the field with another person loading cattle. The interview was held at the kitchen table. No family was around as they mostly lived in town. Just before I left, Ben showed me his computer and the Internet sites that he visits. He had a relatively fast computer with multi media capabilities. He accesses the local weather site regularly to get the equivalent of the TV weather report. When I showed him the satellite picture available at the Bureau of Meteorology site he was somewhat interested.

He also showed me his email and was in the middle of explaining about "Pussy World" when he realised what it was. He explained it by saying "the kids get on the Internet at night." The interview was slightly stilted and I got the impression that he felt isolated.

These entrenched positions are likely to create interpersonal communication barriers. The trend for information from government sources to be increasingly delivered via high technology systems — Internet and computers — has the potential to add to these barriers. While it is commonly believed that computer usage in the "bush" is very low, or that where there are computers they are of low capacity, the group I spoke to indicated otherwise. Many of the interviewees expressed an opinion about or showed an interest in computers. Most of the farmers had computers which they used regularly and two were connected to the Internet. Furthermore, the interviewees recognised the

importance of computers, at least as far as the "younger generation" were concerned, if not to themselves.

> *Anyone from your generation who doesn't use a computer for farming is history. (EB)*

For those who did not use computers, it was because they were retiring or on the "way out" and therefore would not need them. The interviewees that made use of computers were keen for more information in this format. One saw the Internet as a means of overcoming the limitations of living in isolation. Thus, as a study group the interviewees indicated that the social dimension, and not the technical dimension, of communication affects them most in their information seeking.

While there were many trends which the interviewees shared, even the small sample I spoke to revealed what Vanclay and Lawrence (1995) had found — farmers are not a homogeneous group. For example, amongst the interviewees, some are comfortable with technology, not all are into traditional primary production, one has run for government, some are environmentalists while others vehemently oppose environmentalists. I would expect that these differences be reflected in their approach to the issue of El Niño and how they seek scientific information. At the same time I would expect there to be general similarities.

The kit

The group I studied were chosen because they had all sought out and bought the kit. As indicated previously, the farmers were all reasonably well educated and thus from the literature it would be expected that these farmers were generally more keen to learn than others.

In the following section, I will identify how the interviewees have responded to the issue of El Niño. The issues that affect their decisions to seek scientific information are also discussed.

Perception of the issue

Not surprisingly, weather was a central theme in the interviews. All of the farmers described local conditions in some detail during the interviews. They all indicated that, while El Niño may be a new phenomenon in farm management, variability is not. That is, farmers recognise that the weather is variable and must be planned for — a key message the Bureau and DPIE is attempting to communicate to farmers. This suggests that a lack of evaluation by these organisations on the mind-set of farmers, and what they feel is relevant, is one factor leading to their inability to have a meaningful conversation with farmers.

> *Weather is very unpredictable, but you know that if you've been in agriculture all your life. (DSP)*

Similar to the findings of Vanclay and Lawrence (1995) on land degradation, El Niño was seen by each of the farmers to be a problem for others. On the coast, Adam felt that farmers were safer, experience fewer climatic extremes and more prone to flooding than drought. Having spoken to Adam first, it was interesting to see that this attitude was repeated by several of the farmers indicating that they all thought they were better off than farmers further inland, and therefore in less need of learning about El Niño. This "grass is drier on the other side" attitude accorded well with the image they had of themselves as better off and more able farmers.

> *Here is a fairly safe area and you have to proceed as though things are going to be average. (CM)*

An exception was Fred Hardy, who was highly motivated to seek out scientific information for his own purposes. He had a particular interest in how water was allocated from a common dam, on which his farm depends. As a result, he had a clearly identified problem with government and environmentalists, whom he believed were causing water from the dam to be inappropriately allocated. He felt they were mis-applying scientific information with negative results for himself and other farmers in the region. In his office he had various subscriptions to scientific journals such as *New Scientist* magazine and long term weather services. These subscriptions indicated Fred's high level of motivation as they are costly and contain a significant amount of detailed technical information. Fred was also one of the respondents who used a

computer and the Internet to assist him in acquiring and presenting information. He believed that armed with this information, he would be more able to counter the environmentalists or government bodies.

Vignette: Fred, 13/11/97

Fred lived the furthest inland of all the farmers, being half way between Forbes and Condoblin. The day was very hot and dry, however I cooled off as I drove down the palm lined drive way. The house was large and had well kept lawns. I talked with Fred in his office in a separate little building.

Towards the end of the interview Fred and I discussed environmental issues. He was very aggressive and expressed a lot of antipathy towards environmentalists. I kept my opinions to myself! He made the claim that for every scientific proof a "greenie" had about environmental damage, he could give some counter claim.

Fred was involved in a research program studying dam water allocations and the use of computer packages to assist in this. People in the area would come to him when they wanted a graph printed out to prove some point to an official body.

These findings confirm the importance of Gagne's theory in understanding what motivates learning. Those who do not perceive a problem (with El Niño) exhibit little effort in acquiring information. On the other hand, those who are motivated have shown themselves to expend significant time and money in seeking information.

Even for farmers who are motivated to learn about El Niño, there were many conflicting factors preventing farmers from seeking information (supporting the findings of Merriam and Caffarella, 1991). The most significant of these indicated by the respondents was time. Farmers are very busy getting on with the business of farming. Learning about the multitude of topics in this era of information explosion or "info glut" is time consuming. Material must therefore seem very relevant for farmers

to take the time to seek it out and then take it in. As discussed previously, the study group valued learning, but the lack of time for studying El Niño-related literature indicates that it is of low overall importance to them.

> *My son in law is too busy shearing to be really interested, but my daughter is starting to settle down, and if she gives up wool classing she might be interested [in the kit/learning about El Niño]. (DSP)*

David's quote also alludes to the division of labour on farms. It reveals that a greater value is placed on physical work, and therefore other activities such as learning are relatively unimportant for men. Women, on the other hand, are less likely to be involved in physical labour to the same extent as men, and consequently will be available to do "peripheral" activities such as self-education — but according to Alston (1995), not information gathering.

A significant, but less obvious barrier to learning, which was revealed in the interviews, was the lack of awareness of potential sources of information. Many of the interviewees were familiar and conversing with only one major government advisory body. Whenever they had a problem, they would seek out this organisation and talk with a known person at that organisation. Several of the interviewees indicated that they were unaware of other organisations and if their usual source was unable to assist them, the problem was dropped and other bodies were not sought. Even a large and obviously named institution like the Bureau of Meteorology must not be complacent in assuming people know of them and therefore how to access them.

> *I don't [use them] because ... I didn't realise they were putting out information for farmers. I thought they were just generalised weather forecasters. (BD)*

After having been made aware of other relevant advisory bodies, several of the respondents said they were unlikely to use this new source as they believed they would be unlikely to be able to help. Due to information overload, a significant investment must be made by farmers to establish a new source of information. If they are happy with their current source, there is no need to use others even if their current source is unable to assist in a particular situation.

An additional factor, not considered in the literature, was the negative impact upon the desire to learn when farmers are confronted by conflicting information. If information coming from one source conflicts with past experience or other sources of information, the least valued is likely to be ignored or given lesser weight in decision making. For example, several sources of information point out that El Niño is not the dominant climatic force determining rainfall. Therefore a source that claims otherwise is less likely to be sought or given equal footing.

An awful lot of farmers look to the Indian Ocean for rain. El Niño is[mainly] important for northern and coastal Australia because it comes from the Pacific Ocean. (DSP)

This could be of equal or greater benefit than El Niño information. (EB)

El Niño as a general scientific concern, however, has gained credence amongst farmers. Even for those that felt dry weather was "just a part of this country", probing revealed deep concern about extended dries with which El Niño was recognised to have a role. According to one of the interviewees, extensive media coverage has had an influential role in overcoming the scepticism and general lack of awareness of El Niño by farmers.

I think it's getting more relevant now because farming people are more inclined to believe El Niño. When this first came out there was a lot of scepticism, as there always is a lot of scepticism in the bush. (DSP)

In changing perceptions, the media has overcome a negative social norm preventing farmers from wanting to learn about this scientific issue. This accords with one of the reasons identified by Merriam and Caffarella (1991) as to why adults do not want to learn.

Extensive media coverage creates other problems, however, as overexposure can create a back lash, especially when media reports are constantly negative. One respondent said that he saw negative overexposure as causing people to panic and make poor farming decisions. In response to this he took a lesser course of action. If this reaction is common, then such coverage would be likely to result in the opposite to the desired objective — better farm management based on increased understanding and awareness of El Niño.

Thus, a paradoxical situation is created. Extensive media coverage is required to gain rapid awareness and acceptance of a scientific issue. To gain this level of coverage, dramatic images and statistics are needed. The use of extreme examples, however, may be leading farmers to believe that their situation is better than other's. When they compare their situation to the examples given by the media, they are further reassured that they are in a better situation and that they do not have a problem. While they become aware of the issue, they do not think it applies to them and so they are not motivated to learn more.

The kit

The fact that the farmers I spoke to had bought *Farming a Sunburnt Country* would seem to contradict previous arguments regarding their motivation to learn about El Niño. Three factors have been identified, however, as to why the Bureau and DPIE have succeeded in encouraging farmers to buy the kit. First, the price of the kit is so low that one farmer said that it would be no problem just to throw it out if it was of no use to him. Second, as a mixed media package containing a video, the mental investment was expected to be low. Third, the kit answers questions generated by a motivation to learn about the weather in general, and not El Niño specifically.

For example, from years of experience the respondents indicated they know that Australian conditions are unpredictable. What they gained from the kit was a better understanding of how and why there is unpredictability. While the kit provided at least this level of information, it was designed to provide very much more. For instance, the kit is used in an ongoing attempt by the Bureau and DPIE to educate farmers about deciles — a statistical method used to interpret weather events. In the interviews, none of the farmers indicated any ability or desire to understand deciles. This was not because it was too difficult, rather the respondents did not recognise any need to learn about this topic.

> *I don't think deciles is something I can't understand, its just that I haven't tried hard enough or I just don't recognise the need. (CM)*

From Gagne's theory it would be expected that motivating people to learn about a particular issue is problematic, especially if the audience does not see any relevance to

it. The attitude of the interviewees confirmed this expectation. Further, as suggested by Daniels and Chamala (1989), one farmer believed it to be the Bureau's responsibility to show farmers why it is important for them to learn. On more detailed and specific topics, the kit has failed to motivate farmers to learn.

In the next section I will discuss how, having been motivated to seek out information and use it, farmers in the study group learn.

Learning style

Having obtained the required materials or been in contact with the appropriate person, there are many factors which influence the process of comprehending those materials or information received. Being able to speak to someone and ask questions directly of a person was given as the most preferable way of finding out about new information. The reason was that this method enables questions pertinent to the individual to be asked.

> *I probably got more out of the meeting with the guy in Canberra because you can interact with him. (CM)*

Non-personal information sources, which lack this degree of interactivity, undergo a significant amount of "filtering" by the farmer. The interviewees were interested in information that was specific to their needs, and therefore ignore or skip over information that appeared "broad spectrum". This corresponded well with theories of situated cognition where the learning style of adults is based on a "need to know". Even for case studies which featured a farmer this editing process occurred and non-local case studies were ignored. Thus this process occurs not only at the point where farmers decide whether a source is relevant to them, but also when determining what parts of the materials are relevant.

Vignette: Evan, Forbes, 13/11/97

I met Evan in the park opposite the Eugowra pub at about seven in the morning. He was very reluctant to meet with me, giving the reason that he wanted to get to the Orange Field Day before the crowds came. We had both been the day before. I had gone on the advice of David Pike. Being my first field day, I discovered that they are huge affairs with stalls from many agricultural interests. It was a place to meet people, find out about and buy new tools, chemicals and other agricultural equipment. They are held with a carnival atmosphere in which personal interactions are easily made.

As soon as Evan stepped out of the car he seemed to brighten and the interview went well. At the end he asked me about my experiences with racial matters and we had a good talk about race relations — he had been the only one to stick up for some Lithuanian kids at school — and economic rationalism — I told him about some of the ideas I had listened to at the Wagga Wagga Rural 2000 conference. At the end of the interview he said that he had really enjoyed talking to me — we spent one and a half hours talking. And he said that it would probably be the most interesting part of the day. He felt that information and fresh ideas were a bit hard to come by in the "bush".

The ability to discern easily what sort of information is in a resource, and where to find it, is therefore important to farmers. It enables them to determine whether the materials are specific to their needs and therefore worth investing their time in reading it. Summaries, contents pages and highlighted information were all indicated as features that were appreciated and facilitated learning.

You're getting bombarded by information, so you've gotta become more proficient at picking the bone out of the information. (CM)

You need to be able to thumb though things and pick out the things that you want. (DSP)

The importance of information specific to the respondent's own interests and situation was reinforced by a couple of the interviewees who asked for information, computer

packages in particular, in which they could enter their own data. By inserting their own data, they knew they would be investing time in information relevant to them. Furthermore, they could compare their situation to another's, as well as comparing one year with the next. Both of these types of comparisons were valued by the farmers to whom I spoke.

One of the interviewees expressed a preference for weather columns that presented the "raw" data and left the prediction to the readers. This was compared with other types of columns which were considered too general or inflexible to be interpreted in the context that the farmer desired.

Past experience also had a significant impact on the way in which farmers interpreted information. It was apparent that their own observations on the land and past experiences had built up a reservoir of knowledge with which they were comfortable. This knowledge was often the basis on which they judged new information and made decisions.

> *You just work on past experience and what information is available to you ... If you hear the frogs croaking you know there might be rain. I can feel the north easterly wind and south-easter. Cold and wet or cold and dry. (AD)*

One of the interviewees related two events which confirmed the prediction, in theories of situated cognition, that conflicting concepts can be held simultaneously. While on the local council, Adam looked at graphs which indicated to him that there was a 10 year period between drought and flood with three bad years, three good years and four average years. In logical conflict to this however, he said, "all the information available to us doesn't tell us if we'll get rain or not, just the more days without rain, the closer we are getting to rain." These conflicting beliefs appeared valid to Adam in each of their contexts.

The kit

The filtering or scanning process described by the farmers in their information seeking was also evident in conversations about the kit. One interviewee attempted to find information on pasture growth in the kit — something that the kit was not intended to

provide. Clearly he was uncertain of the contents or purpose of the kit. In light of the information glut expressed by the interviewees, the kit could have easily catered for farmers' need to filter information by providing a contents list.

Case studies in the kit suffered from the same lack of relevance and alienation indicated previously. Case studies by their very nature will be relevant only if the case described is very similar to the reader's situation.

Say this particular one here, he's a Queensland cattle producer, so I basically skipped through as I wanted something localised. (BD)

Significantly, the kit did not address an issue that was important to a couple of the interviewees. "It stressed the Pacific Ocean too much, and didn't give reasons why you should look at Indian Ocean also." (DSP) In this respect, the kit has not explained how El Niño fits into the past experiences and knowledge of farmers. This had a negative impact on how they viewed the data.

A discussion of the kit revealed a difference in the way it was used compared with more regular types of information sources such as weather reports or technical manuals. The key difference was that because of the ongoing utility of these regular services, they would be consulted repeatedly. In contrast, the kit is a "one-off" product and by the farmers' own admission would only be looked at once. This creates a difficult situation for an educational product where the lack of reflection or repeat attendance is likely to result in relatively shallow understanding. The interviewees also saw this as problematic.

Another problem is you put it in the cupboard, and then you never see it again. (CM)

Some very specific occurrence, however, such as me coming to interview them about the kit, encouraged a few of the respondents to look at it again. In doing so they responded positively and felt that it reinforced previous learning and corrected some previous misconceptions.

I went back through the kit and I found it enlightening again. (BD)

Kits must therefore be created with the knowledge that they will usually be used only once, probably early on in the information seeker's understanding of the issue. With this in mind, they should be geared to providing a handful of very obvious messages rather than providing a lot of information which the farmer may be loath to even begin to examine.

As an example of this process, Colin picked up that the correlation between Southern Oscillation Index and weather in autumn is not very high. The item that sparked the most interest for David was the El Niño / La Nina graph versus time (24 years) graph in one of the pamphlets included in the kit. He was very interested that there has been more El Niño than La Nina over time. In both situations, the importance of the point isolated by the farmers was indicated by the frequency and weight it was given in conversation with them. Furthermore, underpinning each of the points that the interviewees picked up was a preference for practical application which they could apply immediately. An understanding of this could be used in future kits to augment the likelihood of desired outcomes.

> *Just seemed to me that there was too much of the scientific bit before we really got round to how practically we could use it. (DSP)*

Catering to this expressed learning style may give the impression that farmers will only read the summaries and highlights and miss the important detail. While this may or may not be true, the current situation is that farmers usually pick up only one or two points relevant to them. By providing summaries however, the farmer will be able to more readily discern information relevant to them. The time saved may be used to read more deeply on topics which interest them. By providing too much detail in the first instance it is easy to "switch people off". In this regard, it appears that the learning styles of farmers were not taken into account in the production of the kit.

> *It wouldn't want to be any more detailed, things get too detailed and people don't want to read it. (FH)*

In the next section I discuss whether the preferences indicated by farmers were actually reflected in their choice of information sources and the kit is evaluated for its effectiveness as a communication tool.

Sources of information

The weather is a topic of immense importance and interest to farmers. This was reflected in the variety of sources that were used to seek out this type of information. There was general agreement amongst the interviewees that farmers were more likely to know the weather forecast than the latest news or sports results. El Niño, as a specialised area of scientific knowledge, was another situation altogether. Although the Bureau and DPIE are attempting to encourage farmers to see El Niño as a significant climate force to which they should pay especial attention, none of the farmers indicated that they had specifically sought out information on El Niño. Furthermore, none of the farmers made any reference to the National Drought Policy (1992). This was in accordance with the impression that the interviewees did not perceive El Niño to be a problem for them directly.

For their daily weather information requirements, the respondents used the mass media. In particular they used weather reports in rural newspapers such as *The Land,* general newspapers such as the *Sydney Morning Herald* and television and radio reports. *The Land* was popular because it catered to the different learning styles of farmers by providing several types of columns.

One of the most commonly mentioned other source of regular weather information was "weather by fax". This fax service provides a satellite picture with meteorological information but without interpretation. Weather by fax is extensively used by farmers because it is cheap, accessible — most of the farmers had a fax — and open to their own interpretation. The lack of interpretation appealed to the self-expressed desire by farmers to be independent in their interpretation of information.

> *When I want to get a map I ring up on the fax and it shows me where the cloud is and gives me an idea as to when to cut hay. (BD)*

The sources described above are in regular use because they are readily available and fulfil a predetermined specific need with little effort. They are, however, relatively general and provide few learning opportunities. They are therefore inappropriate for communicating new scientific information. For more in-depth information, other sources of climate information are necessary. This is particularly so for communication

of complicated farm conservation issues which require repeated and ongoing discussion. In seeking non-regular sources on such topics, the respondents confirmed their preference for personal contacts. Personal sources identified by the respondents accord with some of the categories identified by Mortiss (1993, p.120) — media, farmers, commercial, government, professional, family. What emerged, however, was that reliability was the major factor determining the prominence of each source.

For example, while it would be expected that local services would be better able to cater to local needs, this was not always the case. In attempting to use the local harbour weather service, one interviewee's major concern was doubt about its reliability. Large organisations may be clumsy and unable to meet specific needs, but there is a perception that at least they are accountable.

I always used to ring the Albatross, but depending on who you get they might give you the wrong information. (AD)

Other influential local sources of information often include other farmers. Due to the variability of quality, however, there was mixed opinion on this "over the back fence" information.

The older blokes were talking about what happened in the past, but by memory. I don't consider that very scientific, but it worked to a certain degree. (EB)

Scientists and other climate advisory professionals viewed as a group present a credible front, but they are beset by their own problems. The interviewees indicated that on the whole, people from these institutions can be obscure and overly technical in their communication. This antagonised some of the interviewees and led to the belief that scientists were "school masterish". Furthermore, while authoritative, scientists were recognised to be fallible and not necessarily to be listened to or sought out.

A lack of emphasis placed by professionals on past experience was a concern for one interviewee. As indicated previously, farmers placed importance on their past experience and knowledge. By ignoring this and not explaining how previous understanding and experiences relate to the current one, communication is likely to be hindered.

I think that long range weather forecasters have an obligation on them to at least try and take some of the stress out, if historically it can be said that, 'look it was not that bad say in 1967 or 1954 or whenever bad years were.' (DSP)

Individually, however, some scientists and advisers were viewed differently. An example was Fred Nelson, an ex-CSIRO scientist. He is a member of David's Rotary club and is a well known forecaster. David has only known him for three years, but a friend has known him for 10 years and "swears by him". Fred is a well respected person in the community as reflected in the echoing of Fred's comments about historical records by David. Fred Nelson has had a significant impact on farmers in his area because of his ability to understand the needs and questions of the farmers.

He's accepted because he is getting somewhere with the results. (DSP)

Particularly in communicating farm management conservation issues, which requires repeated and ongoing discussions, a relationship needs to be built between farmers and advisers. In building a solid relationship, each party comes to understand the other's perspective and therefore can talk about an issue as it relates to their particular situation. Personal relationship allows a gradual awareness of issues and their relevance to be explored. This cannot be done through glossy brochures or other information "products". The relationship can later be "used" by the adviser to point out information products that may be of use to the farmer. For the farmer to make the first step in establishing such a relationship however, the importance of knowing of a source and how reliable it is cannot be understated.

The kit

Farming a Sunburnt Country is only one mixed media kit among many that are available. It is an example of a one-off, non-personal information source. The majority of the interviewees had bought the kit as a result of a personal introduction. The kit was used by the interviewees only once before being put away, in one case to be forgotten completely.

While not a significant source of information, the kit appealed to many of the farmers — the glossy format, the video, the attractive booklet and brochures all within a neat and cheap package.

I'm a bit of a sucker for these sort of things. (CM)

While the video was viewed as the main selling point of the kit, a common complaint was that the video was inadequate as an information medium. Although there was an expectation that the farmers' questions would be answered within the video, the information presented in it was insufficient or not specific enough.

Of all the materials included in the kit, the video was of most use to David as it was accessible and did not require much effort to use. He suggested that if one wanted specifics one could use the booklet. David indicated a preference for a differentiation between information provided in each medium — with more detailed information being given via more concentration-dependent media. The video also had impact on Evan who considered the visuals to be important, especially in explaining difficult scientific concepts such as the Walker circulation.

On the issue of credibility, the video made it more difficult to keep information current and therefore reliable and relevant.

I know for a fact that the Darling Down went through a shocker... There must have been a bit of egg on the face of people that made the video. (DSP)

The dichotomy between the use of video as a frill to attract users, and its inability to meet the needs of the user was clearly demonstrated. The Pikes were an exception to this as they used the video to educate and entertain visitors from the city. They found the video in particular to be very useful and have used it repeatedly. Having watched the video frequently, the Pikes found that they gained a lot from it. This was reflected in the level of detail at which conversations on El Niño were conducted. After significant probing about the kit, Sonia and David both alluded to the importance of establishing a relationship between farmers and advisory bodies. In this respect, and as an educational medium, the kit has failed for the majority of users.

The kit helps you access the bureau, that's what it is all about isn't it. But hell if we can access the bureau and feel confident and we should be able to [then that's what we are after] (DSP)

Vignette: David and Sonia, 12/11/97

I met David and Sonia at their home and bed and breakfast just out of Canowindra. I had just come from a road-side fruit shop with a frozen strawberry iceblock in my pocket. I pulled it out and it was dripping everywhere so I stuck it in my mouth and could not speak my mouth was so full and cold. There were lots of chuckles. We settled down in their "turned upside-down" living room — they were baby sitting their grand daughter — them in chairs and me comfortably on the floor. The interview was relaxed and enjoyable. This encounter was unique in that a woman — Sonia — took part in the interview. She spoke infrequently, however, and was often spoken over or repeated by David.

The Pikes were in the process of retiring from cattle farming and had set up a bed and breakfast. One of their visitors, a DPIE scientist, had recommended that they get the kit. They did and have found it very useful in answering questions that "city folk" guests have about the country. They have used the video often and have had a bit of time to reflect on it.

In the next section I discuss behaviour change that has occurred as a result of the kit.

Behaviour change - the kit

The kit has had some success in encouraging behaviour change. Changes that have occurred, however, have required little effort or risk, and have been context specific, meshing easily with past knowledge and experience. For example, the kit prompted Ben to record weather statistics and helped Sonia discover and use weather by fax.

These changes while important to the individuals concerned, were fewer in occurrence and less far reaching than could have been expected from such an initiative.

On more fundamental issues, the kit has had less success in changing behaviour, especially with respect to conservation farming or attitudes toward the Bureau or DPIE. The risk involved in changing was a key factor identified in determining the likelihood of that change occurring. For example, large farming decisions such as destocking, and when or whether to plant a crop were not ones that Colin felt confident to make based on statistical type El Niño information. The difficulty lay with the perceived risk in making such a large decision on what Colin considered to be an externally decided, nebulous concept. In his region, the benefit of changing did not seem to warrant the risk.

I think that if I was further out, I might be more inclined to use it to influence my decision making.(CM)

Vignette: Colin, 11/11/97

I met Colin at his home 14 kilometres from Boorowa. On the way I almost got killed as a gust of wind sent my motorbike careening on the muddy wet road, but somehow I managed to stay upright! On an adrenalin high, I was shown to Colin by his wife who stayed in the kitchen and did not participate. We had a common interest in motorbikes which provided a good start to the interview which was held in the room next to the kitchen at a dining table.

Like many of the farmers I had visited, Colin had a section of the farm which was used for something other than cattle. Colin had a section of his farm fenced-off and designated a wildlife refuge. In the refuge Colin had created a small lake and island to which birds, fish and animals visited. The fence line had been planted out with saplings, as had the island.

Even a good understanding of El Nino does not necessarily result in good farm management. Social, economic and past experience were some of the other factors that influenced final decisions to change. For example, economic factors sometimes work against farmers making the "best" decision based on the climate information alone. Colin pointed out that he was reticent to destock too much as a result of a negative trend in El Niño — potentially leading to less rain — as if it did rain after destocking, the price of cattle would go up and it would be too expensive to restock. Past experience led Colin to make decisions based on a program which had been running well for several years. He is flexible and modifies this program according to climate changes, however ground cover was the crucial determinant as it is a very visible and obvious indicator of conditions.

I'm very aware of ground cover.(CM)

In contrast, one of the respondents did adjust his farming style in response to El Niño information gained from the kit and other sources. Evan usually based farming decisions on soil conditions, but in July last year when El Niño was well established, he destocked. This was a significant decision involving considerable risk, as the farm had never been destocked in his memory. "The decision was based on the likelihood that El Niño would continue for another 12 months and turned out to be a very successful decision." (EB) He restocked this year, a decision which was based on the success of his previous decision and understanding of El Niño. Evan was the only respondent to have made such a dramatic change and the advice of a climate analyst was influential in his decisions.

Having made farming decisions long before extension existed, farmers recognise that they bear the brunt of any change in farm management. They will therefore make their final decision on an evaluation of the risks and benefits as they see them, even if they do appear conservative to institutions pushing for change. That being said, it must be remembered that not all decisions will be rational. Some decisions are made on a "gut feeling" while other people are "gamblers".

At the end of the day you have got to make the decision yourself. (CM)

Summary

While the farmers were all different, they were also all well-educated and interested in learning — which was why they had bought the kit. They were interested in learning more about weather, but the majority did not see El Niño as an issue directly relevant to them. On certain issues which individual farmers perceived to be of relevance to them, they were highly motivated to seek out information. Even when motivated, however, several factors were identified which hindered their ability and desire to seek information. Key amongst these was lack of time followed by lack of awareness of other sources of information, conflicting information and media hype.

Having decided to learn, past experience and knowledge had a significant role in determining how information was sought out and accepted. Sources of information were categorised into regular and non-regular. Regular sources — such as weather reports and weather by fax — were selected to fulfil a particular need. Regular information from non-human sources were often brief in content and consistent in format.

Sources of information could be further categorised into personal, and non-personal sources. Personal sources of information, such as well known and trusted weather advisers, were the preferred method of seeking information, as questions pertinent to the farmer's particular situation could be asked. Personal contacts had the added potential of allowing a strong relationship to be built in which significant and detailed scientific information could be communicated.

The use by farmers of irregular, non-personal sources of information such as the kit was highly specific. These sources were usually only used once and only one or two relevant points were withheld by farmers. Points retained were often considered valuable to the farmer because of their immediate practical use. It was noted that personal contacts often had a significant role in influencing farmers to seek out and use non-personal sources of information.

The kit

The kit has been bought because it was expected to provide an easy and cheap way of learning more about the weather. It has failed, however, to interest the majority of farmers in El Niño. The kit, like all non-personal, irregular information sources was scanned for information that appeared to answer questions farmers wished answered. Because the kit did not deal with these questions, much of the kit was ignored and only very specific points were picked up from the kit.

The video was seen as a positive aspect of the kit but only in so far as it provided introductory material on weather. In terms of behaviour change, the kit was only able to encourage relatively minor changes except in one instance. The kit failed to establish a better relationship with or awareness of the Bureau or DPIE.

In the next section, the views of those who produced the kit will be presented.

Department of Primary Industries and Energy

> The kit was initiated under the National Drought Policy from an education and communication angle around 1993. The idea began in the National Climate Centre and a proposal was forwarded to the DPIE. The DPIE funded and contracted the Bureau of Meteorology to produce the kit. (Mary Voice, Bureau, email 3 June, 1997)

Objectives

The kit was aimed at a general audience, but it was produced specifically for farmers. The intention of the producers was to educate farmers and make them aware of issues surrounding El Niño because they believed that few people knew about it. The kit was designed to integrate with other mixed media kits developed by the DPIE. The producers aimed to present information in a style which got away from "doom and gloom" and promoted positive outcomes and therefore a positive attitude towards learning about El Niño.

We achieved what we set out to achieve. Something that is easily understandable, that people can relate to, will grab attention, ... deliver quite a lot of information, [increase] awareness and ... understanding of what Southern Oscillation Index is about. (Bernie Scott, interview 10/9/97)

Perception of audience and self

The people in the DPIE to whom I spoke had a perception of farmers that appeared to fit very much within the transmission model of learning and communication.

[We want to] get that message in. Get it in early enough and that message will stick and go throughout the whole system. (Bernie Scott)

The language used was authoritative and the prime objective appeared to be "getting the message in". This, as well as the focus on innovators, indicated a lack of understanding of the importance to consult, collaborate or involve farmers in developing a two-way flow of information. This also indicated a limited interest in the different needs or world views of different farmers.

... important to get the farming community to see that they have to become more self-reliant and that government assistance is not going to be for time immemorial and that it will reduce over time. (Bernie Scott)

Evaluation

This assumption of who farmers are, and the lack of action to find out the needs of the farmers was reflected in the way the kit was produced. The kit was produced in an "iterative process" with CSIRO, Bernie Scott, Bureau of Meteorology, and Richard Keilly (producer) — farmers were not part of the production process. Farmers were involved only to be included as case studies in the booklet.

The producer really dictates what goes in there. Quite a number of meetings to decide just what we wanted. (Bernie Scott)

The video itself was produced by somebody with experience in agricultural productions, but it is only one aspect of the kit. In deciding what other materials would go into the kit a haphazard approach was taken. Anna, who was involved in distributing and packing the kits, indicated that any pamphlets or materials that seemed relevant

were included. They were unaware of how the kits were being used, what has been useful and what has been a hindrance in the kit. This indicates a lack of understanding of how to target the needs of farmers — especially in light of the farmers' preference for relevant information to be easier to identify, not complicated by an excess of materials.

> *There is a lot of information and so something will catch their attention. I hope that they are interested enough ... to follow it up using the contacts [provided]. (Anna Pellew, interview 10/9/97)*

The producers of the kit believed they had produced something worthwhile and achieved everything they set out to achieve. Little concrete evidence for this existed because their feedback has come primarily from rudimentary sales figures, periodic comments at field days and an international video award. No formal evaluation has been done nor is there likely to be any. The people I spoke to expressed the idea that evaluation was important, but had only become so in the last twelve months. When asked whether evaluation would be incorporated into a new edition of the kit, they said it was unlikely. Furthermore, while they have a folder full of receipts they had not been sorted or analysed for marketing or analysis purposes. An interesting thing I noted about the receipts was that around half of the people paying for the kits were women. This provided further evidence of the influential role, identified by Alston (1995), that women have looking after finances in rural households.

Overall, this suggested that the importance of evaluation was very conceptual and not standard practice at the DPIE.

> *We've never done an evaluation of the video itself; and I guess it was always envisaged just as a general education tool. So I'm not sure how much we could get out of such an evaluation. Nonetheless we are very interested in the links between the information we provide and its effectiveness / education.' (Clare Mullen, Bureau of Meteorology, email 13 May, 1997)*

Clare's comments revealed the problems with the way in which evaluation was conceptualised. Rather than determining the value of the product or service for the audience, evaluation in this climate of economic rationalism tends to be outcomes-

focussed. This type of evaluation is limited in its use as it ignores differences between farmers.

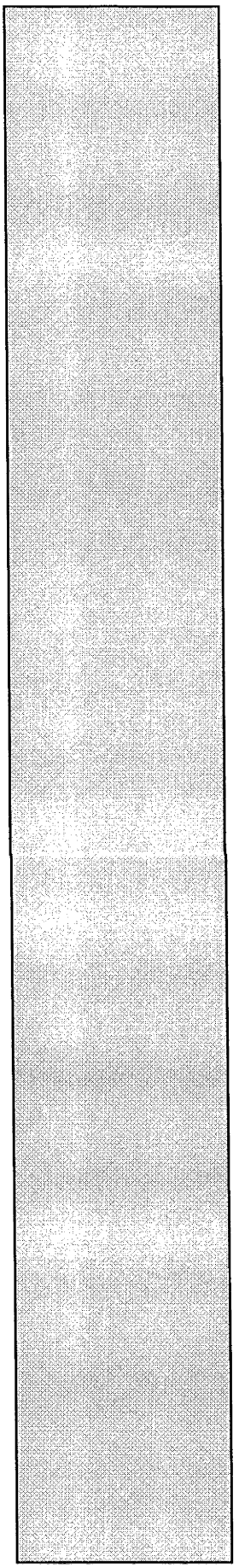
While realising that financial and time considerations play a role, the lack of any evaluation or feedback mechanisms suggested that the DPIE did not really consider the opinions or comments of farmers important enough to incorporate into the production of materials. This was consistent with the lack of involvement that farmers had at the formative stage of the kit.

In summary, the kit was created to educate farmers about El Niño to make them more self-reliant in managing for climate variability. It was created without consultation or involvement of farmers within a top-down, linear transfer paradigm. Little evaluation of the kit was done before, during or after the kit was made.

In *Chapter 5: Conclusions* the implications of these finding with respect to the research questions are discussed. Limitations to the study are stated and recommendations for further research are provided. Methods of improving scientific communication as it relates to farmers and mixed media kits are suggested.

Chapter 5:

Conclusions



Introduction

As a result of the National Drought Policy (1992), drought assistance is now provided in Australia only after a declaration of "exceptional drought circumstances". Under this policy, drought is no longer considered to be a natural disaster but rather, an integral part of a highly variable climate. Thus the government seeks to encourage agricultural producers to adopt self-reliant approaches in managing for climate variations.

For farmers to become self-reliant, an understanding of meteorological processes is crucial. Since the imposition has been made by the government, responsibility lies with the government to facilitate farmers' move towards greater self-reliance in this respect. This study has focussed on a mixed media educational package on El Niño called *Farming a Sunburnt Country* developed by the DPIE and the Bureau.

The difficulty in achieving self-reliance through education is complicated by the scientific basis of meteorological information. This is further exacerbated by archaic models of communication that have traditionally been used in agricultural extension. Little research has been done on understanding how farmers seek scientific information or how effective mixed media packages are in communicating such information. This study sought to answer the following research questions in order to improve future science communication;

- How do farmers acquire scientific information?
- In what ways is *Farming a Sunburnt Country* successful?

In *Chapter 2: Literature Review*, theories relating to the communication of science, learning theories and behaviour change were discussed. Communication theories revealed that shared meaning or common understanding was at the heart of effective communication. Science, however, has particular features which make it particularly problematic when farmers and scientists attempt to find common ground. As a subject discussed in scientific terms, El Niño was therefore likely to be difficult to understand for the non-scientist. Gagne's theory predicted that farmers would be unlikely to be motivated to learn about it. Even with topics in which farmers were motivated to learn, differences in learning styles were predicted to affect the way in which information was used and comprehended. Furthermore, behaviour change theories revealed that in

attempting to alter the behaviour of farmers, the attitudes of farmers were often inappropriately targeted.

Mixed media as a communication tool was also discussed in *Chapter 2: Literature Review*. It was found to have great potential to effectively communicate scientific issues. The lack of evaluation on mixed media packages, however, was identified as an important area which needed to be addressed. Video in educational mixed media was seen to be constrained by its perception as an entertainment medium.

Following a consideration of the recommendations described in *Chapter 3: Methodology*, semi-structured, open interviews were conducted with six farmers and three employees from the DPIE. The farmers were asked about their experiences with and perceptions of the kit, while the DPIE respondents were asked their intentions in creating the kit and how its effectiveness had been evaluated. The interview data was analysed with the active nature of both interviewer and interviewee in mind.

In *Chapter 4: Results*, the findings supported and were consistent with the hypotheses identified in *Chapter 2: Literature Review*. It also emerged from the results that farmers prefer to deal with people, rather than information products, and when using non-personal sources, farmers prefer materials which facilitate rapid and easy identification of relevant information.

The conclusions addressing the research questions are presented in the next sections. These are followed by a discussion of the limitations in the study and recommendations for facilitating the acquisition of scientific information by farmers and for improving mixed media education kits. Finally, suggestions for further research are given.

How do farmers acquire scientific information?

The crux of the problem identified in this study is that El Niño is promoted and discussed from a scientific perspective using statistics, probabilities and deciles. As discussed in the literature, communication of scientific information is complicated by the great gulf in understanding that must be bridged in order to achieve any degree of

shared understanding. Without that shared understanding, farmers are unlikely to see how the arguments of scientists or extension officers are relevant to their situation. The farmers in this study supported this in expressing the view that extension materials are often too detailed, technical or are isolated from their experiences and knowledge.

The findings in *Chapter 4: Results,* indicated that the perception that El Niño was irrelevant to their situation was the primary stumbling block in motivating farmers to seek information on it. As identified in the literature, past attempts to increase educational efforts have been focussed on changing the attitudes of farmers towards conservation farming issues such as El Niño. The results of this study indicate that this approach is likely to fail because it does not address the real problem.

In addition to the alienating manner in which El Niño is communicated, and therefore the lack of relevance which farmers attribute to this topic, this study found that behaviour change was a result of a complicated mix of overlapping considerations — scientific, economic, political, social and "gut feeling". Any attempt to change the behaviour of farmers which addresses only one of these considerations will also be unlikely to be successful. Furthermore, outcome-driven evaluations are unable to identify and elucidate these considerations and will therefore be ineffectual in gauging the reasons behind the success or failure of extension activities or in improving future extension.

The findings revealed a functional difference between "regular" and "non-regular" sources of information that farmers seek out and use. Regular sources of information, such as daily weather reports, were brief and used within a specific context for a specific purpose. For these reasons, these sources are unsuitable for communicating new scientific information. Non-regular sources of information, such as occasional discussions with advisers or the use of a mixed media kit, are able to communicate new scientific information more effectively because of the more flexible way in which farmers approach them. Since non-regular sources are used infrequently, however, they are slow means of communicating new scientific information. It would be advantageous to investigate methods of altering regular sources, which have a high audience penetration and reading occurrence, to communicate new information.

Communicating new information about climate is fundamentally different to communicating about a new agricultural product. The issues surrounding El Niño are not simple and causal relationships between events are especially difficult to establish. In order to convince a farmer to change, therefore, a significant amount of trust on behalf of the farmer is involved. Only personal sources of information are likely to be build that trust because of the flexibility with which person to person interactions can be conducted.

The importance of personal interaction was expressed by the farmers in the study. They indicated that if they were to seek out new scientific information, they would be more likely to go to a person than a non-human source. The increasing provision of information via computers and the Internet would therefore seem contrary to the needs of the farmer. It could be argued, however, that as farmers become more familiar with such technology, they would increasingly seek information from this source. The results of my study certainly reflected such a change in information seeking habits, however even the most computer literate farmers indicated that still they preferred dealing with a person. Personal sources of information were found to be important gateways in making farmers aware of various information products available, building relationships with advisory bodies and facilitating fundamental behaviour change.

To encourage farmers to use personal extension services, they need to be aware of their existence. This study found that farmers were often unaware of the variety of information sources available to them. Furthermore, once they were made aware, they believed that these new sources would be unable to help. This suggests that more work needs to be done in making farmers aware of information sources and how they would be useful to farmers. Making farmers more aware of the different sources available to them is a crucial first step in allowing farmers to identify the best source for their needs.

When it comes to communicating complex scientific issues, such as conservation farming based on an understanding of El Niño, irregular, personal information sources are most likely to be effective. Extension services therefore need to be improved, increased and promoted to assist farmers to acquire scientific information.

In what ways is *Farming a Sunburnt Country* successful?

The kit was bought by farmers who were keen learners, but with the intention of learning about climate in general, and not about El Niño in particular. This was because the majority of farmers did not believe El Niño was relevant to them and therefore they were not motivated to learn about it. For the majority of farmers, any learning about El Niño was peripheral to what the farmers intended when using the kit. The kit was positively received, but on closer examination, deficiencies emerged. The video in particular was viewed positively, but, it did not adequately answer questions relating to specific problems which the farmers had. Furthermore, while videos were perceived as an easy way to learn, this conflicted with the inflexible delivery mode and prevented deeper learning from occurring. Video will retain this role as attractant or "frill" until perceptions of video and its implementation as an educational medium change. Furthermore, until such a change occurs, content should be organised so that as the concentration required for a particular medium increases, so does the richness and depth of information it presents.

David and Sonia Pike were an exception to the findings above as they used the video repeatedly. For them the video was pitched at an appropriate level — they were, however, using it as "edutainment". In using the kit repeatedly they learnt a significant amount about El Niño. Evan Bishop also found the video met his needs and used information gained from it and other sources to influence his farming decisions. It is clear, therefore, that while the contents of the kit are appropriate, they are only influential if a farmer recognises the relevance of the El Niño-related information to them. Evan's and the Pike's examples highlight that the kit does not address this point. Difficulties arose because the learning styles of farmers were not accounted for and the manner in which El Niño was presented in the kit did not adequately explain how it was relevant to farmers. As identified in *Chapter 4: Results*, farmers usually only use information kits once, and only pick up one or two points of information each time. If the kit had been developed with these considerations in mind, more wide-spread learning and behaviour change might have occurred.

Taken individually, the various components of the kit were considered adequate. Taken as a whole, however, the kit emerged as being poorly designed. Different parts of the kit attracted the attention of different farmers in a process dictated more by chance than by directed information seeking or learning. The addition of copious quantities of pamphlets, brochures, books and the video made identification of materials relevant to a farmer's needs unnecessarily complicated.

While the DPIE had worthy objectives in commissioning the kit, they were hampered by their simplistic view of farmers and an outmoded model of communication. Many of the problems identified by the farmers probably stemmed from the linear transfer model of communication used by the producers at the DPIE and Bureau. As such, the kit has not met the needs of the farmers in relation to questions about El Niño and for the majority of farmers no real changes have resulted from the kit. Furthermore, the kit has been unable to establish a relationship between farmers and the Bureau or DPIE. At a fundamental level, the kit has not addressed the producer's aims in assisting farmers to become more self-reliant with respect to climate variability.

In the next section I discuss the limitations of the study, and their implications for the conclusions.

Limitations

As discussed in *Chapter 3: Methodology,* there are significant limitations in the scope of this study. Several limitations were identified in the study group chosen. The farmers I spoke to were all well-educated which, in the literature, places them in a group that is keen to learn and more willing to seek out information than other farmers. Having interviewed only farmers who have bought the kit, I selected a particular demographic who may have particular information seeking styles. Thus the conclusions I have reached may be applicable only to farmers who are keen learners or relatively well-educated.

It was discovered in the course of the interviews that farmers in different areas of Australia look to different places for rainfall. The group I interviewed, with the exception of Adam, all looked to the Indian Ocean rather than the Pacific Ocean — the source of El Niño flood and drought — for rain. This added a potentially confounding factor where the geographical location of the farmers, and not the scientific aspects of El Niño, were the reason why farmers did not see it as relevant to them. Adam, however, gave the same reasons as the other interviewees as to why El Niño was not relevant to him. This would suggest that location was not a major influence but this aspect was not adequately addressed in the study.

In answering the research question, climate information was the only type of scientific information that was examined. The literature did not identify any differences in issues of communication between different areas of science, but, the field is only young and therefore there is, as yet, little research on such issues.

Another limitation in the study group was that the producer of the video — who had significant experience in agricultural productions — could not be interviewed. Those that were interviewed however, have helped to illuminate how the kit was produced and have been most helpful in gaining an understanding of how the kit has been handled, marketed and evaluated, post-production.

In conducting the interviews it would have been preferable to spend longer than an hour or so talking with the farmers. In doing so, I might have gained a greater understanding of the context in which they think, feel and behave. Furthermore, time constraints prevented me from doing follow up interviews which would have enabled me to ask further questions to fill in missing data, pick up on particularly interesting issues or confirm previous findings.

Finally, the change in research focus after the interviews were conducted and data analysis had begun resulted in data that was not always sufficient to completely answer the research questions. For example, in hindsight it would have been advantageous to ask the farmers about their experiences with personal sources of information.

In the next section I discuss how the acquisition of scientific information by farmers, and mixed media educational kits in particular, could be improved.

Recommendations

Facilitating the acquisition of scientific information by farmers

The main objective in facilitating the acquisition of scientific information by farmers should be to empower farmers to use their own skills to determine what problems affect them. They should then be encouraged to set their own agendas and find their own solutions to the problems which they, themselves, have identified (in keeping with the recommendations of Vanclay & Lawrence, 1995). To assist farmers from having to discover all the problems by themselves however, extension officers could have a significant role in guiding farmers to problems that other farmers and scientists have previously identified. To maximise their success, extension officers should be trained in the social aspects of facilitation, as well as the technical aspects of agricultural extension.

Having identified their own problems, farmers need to be able to determine where to find relevant information. As identified in this study, farmers would benefit from information providers and their materials being clearly identified so that farmers can determine the most appropriate source from which to gain information. In choosing their own preferred sources, the learning styles of farmers will be more likely to be catered for. It would also be more likely that scientific information would be understood and therefore play a greater role in determining behaviour change.

To facilitate the role of science in decision making, scientific issues should be integrated with political, social and economic issues to encourage farmers to see science as practical and reliable. Another way of helping farmers make use of and increase their desire to seek out scientific information is to write in "plain English". By writing plainly, the information will be more easily understood and integrate with farmers' knowledge. The practical aspects of the scientific information should be highlighted and summaries of materials included. By "bridging the gap" between the worlds of farmer

and scientist, farmers are more likely to recognise the importance of science in their decision making.

While instituting such changes to personal extension services will take time and money, there are some simple guidelines which could be followed to improve information products immediately.

Improving mixed media education kits

The information in kits can be improved in two ways. One is to improve the learning that results from the kit, while the other seeks to improve the way in which the kit is used to establish a conversation between producer and user. This study has identified methods of doing both.

Farmers need to be able quickly to identify whether the materials that are contained in a mixed media education kit will address the issues that concern them. Therefore the aims of the kit should be clearly stated and the contents identified. This process must continue when farmers are looking over the contents. The contents should therefore be prefaced by a clear summary which farmers can read before reading the contents in detail. Farmers, like most adults, learn on a "need to know" basis, so the focus of all materials should be predominantly practical. Furthermore, practicality is often determined by the specificity of the information to the farmer's own situation. To cater for this, materials should be developed to allow farmers to input their own data into a table or graph which will enable them to compare their situation with another place or time. Finally, taking advantage of the perceptions of ease of learning of different media, one could increase the richness of data as the concentration requirements of the medium increase.

The kit could also have a significant role in building a relationship between advisory bodies and farmers. As a front-line interface between farmers and organisations, the kit should attempt to make farmers feel more confident about approaching an organisation by clearly identifying the organisation and the services they provide. In using the kit to build a relationship, formative and post evaluation is crucial. These processes ensure that the experiences, knowledge and concerns of farmers are being addressed and

therefore increase the likelihood of mutual understanding. Dialogue started through evaluation, if reflected in the way kits are produced, will be evident to users of the kit. This may encourage farmers to view such an organisation as open, approachable and relevant.

Further Research

A priority for further research is to determine how accurate the findings and conclusions are in relation to people who have not bought the kit. More specifically, it would be of interest to see how a study group of farmers who had not completed high school education responded to the interviews.

The study was also limited in geographical scope which may have resulted in a particular perception of El Niño predominating. Interviews with people who have bought the kit in different regions could help to elucidate the importance of geography with respect to the lack of motivation to learn about El Niño identified in the study group.

It would also be useful to evaluate a kit that has incorporated the degree of evaluation suggested in this study. Research of this sort, covering the issues brought up in this study, might provide a control study from which to compare findings.

Finally, it would be worth conducting the research again with the specific research questions in mind.

Vignette: Evan, David and Sonia

I felt that two of the interviews conducted were particularly interesting — those with Evan, David and Sonia. I believe that a comment from each of them really expressed the answer to the research questions.

In answer to the question "how do farmers acquire scientific information?" Evan noted that "communication is an art we have not yet mastered." As the farming and scientific worlds progress, therefore, new studies will have to be conducted and different communication strategies adopted. While communication based on shared understanding is essentially unattainable, it is the goal to strive for.

In answering the question, "in what ways is *Farming a Sunburnt Country* successful?" David and Sonia said, "the kit helps you access the bureau, that's what it is all about isn't it ... but hell if we can access the bureau and feel confident and we should be able to [then that's what we are after]." The real goal in producing information products should, therefore, be seen as a process of introducing and establishing a conversation between producer and audience.

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Appendices

Appendices

Survey Questions

Survey questions for the producers of the kit

TAPE ID (time, date, who involved)

Who was the kit aimed at?

How has the kit been marketed?

How does the kit fit in with other projects?

What were your intentions in making the kit? (fulfilled, time frame?)

How do you picture/ conceive of your audience? (Intended audience, Age, Women, Literacy and education, Stewards/ conservers)

What role do you see that the DPIE and the BoM play?

What do you see as the audience's needs and how have they been met?

Was any formative evaluation done?

How did you decide on the content of the resource kit?

How did you decide on the presentation of climate information?

How do you see the kit being used? (parts, order)

What problems were encountered in producing the kit?

Has any post evaluation been done?

What feedback have you got?

How have you facilitated this?

Have you acted on this?

On what basis was the video awarded an award?

Anything additional you would like to add?

Survey questions for primary producers

TAPE ID (time, date, who involved)

Is the kit appropriate for farmers? (Reaction Evaluation)

How interesting did you find the kit?

Who used the kit? (family, friends, staff?)

How was the kit used? (What parts of the kit, What order, How long, video problems, where (environment where learning took place)?)

Video: any problems using it?

Text: Did you read it?

Posters: Did you pin them up?

To what extent did this session deal with your real concerns?

In what ways do you think the kit is well/poorly designed?

(Content, style, presentation, language)

Do you know/respect Ian McMillan?

Would a study guide/schedule have been helpful?

Was the message obvious?

How could the kit be improved?

How did you find out about the kit?

Why did you buy the kit?

What did you expect from the kit? Were your expectations met?

How does this kit compare to other resource kits?

Is the kit appropriate for communicating climate information? (Learning Evaluation)

What is the climate like in your area?

In what ways did you find the kit useful/irrelevant? (relevance, knowledge, sources of info, relaxed with info?)

Case studies

Rainfall records: mean, median and deciles

El Niño

Probabilities

Internet, Fax and software ads

Is the kit appropriate for promoting a conversation? (Behaviour Evaluation)

What role does climate information play in your farm management?

Where do you get climate info from?

Which info do you trust?

What do info you act on?

How effective do you think the kit is? (Waldron: 177)

What impressions did you get of the DPIE and BoM from the kit? (relevance, competence, approachability)

Are you more likely to talk to the BoM or DPIE for information after having seen the kit?

Outcomes

Has the kit influenced you in any way? (changed knowledge, attitude, behaviour)?

esp climate and land management & the DPIE and BoM

What do you see yourself doing differently after using this kit? (Waldron: 176)

Demographic information

How would you describe the work you do?

How long have you / your family been in this activity?

Are there any community groups in your area?

What do you envisage will happen to your land and families involvement in the future?

What age bracket are you in?

How did you find out about the kit?

How are land management decisions made on your property? (people, methods, records, computers)

What role do you think climate information has in farm management?

Anything additional you would like to add?

Complete Transcript

Fred Hardy 13/11/97 40 km out of Forbes, at his home

I've got all that. Is this the latest one?

April 97, Seasonal Climate outlook

Latest one is predicting well into the autumn, I think it may go longer.

Are they the three month ones?

No the monthly ones

Explanation of what I am doing..... Saw the kit, I'm doing a science communications degree so I'm looking at the communication aspect of this. Independent evaluation of it, not connected with the bureau or DPIE.

Queensland right?

There's one in Queensland too. There's the Queensland one and the NSW Canberra one too.

Yeah but NSW haven't done any of this. They don't believe in it. That's all connected to DPI Queensland.

OK

The Rainman program that I've got here is DPI Queensland.

Yeah that's DPI Queensland. Commonwealth.

They supply some....

I'm asking people who have bought and used the kit their suggestions, feedback to try and improve the kit. To find out how valuable they found the kit.

When did you get the kit?

Two or three years ago

How did you find out about it?

I don't know, I think I just saw an article on it and it interested me and so I rang up the DPI Queensland and I talked to them, not a lot but I talk to them every two to three months. I m involved with them in a thing now. I've found them to be very nice lot of fellas, very communicative and very interested in what they are doing

What are you doing with them at the moment?

I've been trying to.... I've forgotten what I'm supposed to be doing, I've been that busy, I did an exam yesterday.

How did that go?

Up the SHIT! I'm VERY PUT OUT. I done two units of statistics, one at Deakin and the other one, against all odds was great, lecture on TV and then tip top tutors. Unfortunately this time I got a bloody man, no lectures, and I reckon he was lazy.

So how did they teach that one?

Well they didn't teach it! It cost $900 for twelve weeks and that's what we got through in twelve weeks (very large textbook) and not one lecture.

How did they go about doing it Then?

Well when you got into trouble you rang em up, you rang this number up.
He had a very guttural accent, which is not his fault, and he talks terribly quickly.
And I tried many time by faxing him and asking him to fax me the answers, which he wouldn't do because it was more trouble.
I finished up going to Charles Sturt and ringing them up and I got a very nice man there who gave me a bit of tutoring. And I learnt more in three trips there and three hours than I did in three months. But then of course what crucified me yesterday was that the original exam you could take everything in and I got a credit in the original exam and I was aiming for a distinction you see.
And I've been for three months I've been doing 5 - 6 hours a day, I've been getting up at half past 5 every day, and I had everything tabulated, assignments and problems in the assignments so that whatever came up in the exam I could put my hand on it.
All you could take in was the bloody textbook and the textbook was bloody useless.

Frustrating

It wasn't frustrating but it really did upset me and I didn't settle down for an hour.
I wrote him a letter on the end of the exam paper.
I'm going to wait until the results come out and I'm going to get onto the.....
it was a very poor course I thought for $900
and the study guide had several mistakes in it which I spent, two of them I spent at least a day on them until I worked out that the study guide was wrong.

Did they ask for any feedback?

They will I think, and they'll get it
Any way that not what you came for.
I could get the minutes of the meeting for Rainman if you like.

I've got to go and check the irrigation in three quarters of an hour so I could give it to you then.

So why did you buy the kit?

The weather interests me

I've been getting this thing for two or three years (Seasonal climate outlook).

One of the major things is hay. Predicting the seasons, the weather, if its going to be wet then your hay is not going to be any good.

So it interested me.

The DPI men interested me

Did you have much to do with them before?

No never before.

It's only with this (the kit)

Is this the one that Neil Inall is in?

Yes

I think it might have been the one I saw in the land

What were you're expectations when you got the kit? What did you think you would get out of it?

Nothing really more than what I thought, which was that is a probability thing isn't it. See a lot of people, farmers get disappointed with these things, cos they say it wrong. But its not wrong, you would know as well as I do that there is a very big difference between predicting the weather and predicting the climate.... very big difference. Up to four days you can predict the weather, but once you go past that its not on but you can still have a fair chance of predicting the climate but definitely not the weather and that's what a hell of a lot of people won't accept or try to understand.

So how did you think this kit compares to other kits?

I haven't really used any others except

oh I get the long term forecast from America, do you know the ones I'm talking about.

Not really

I'll get you one of those too.

Couple of fellas down in Melbourne have articles in this overseas one, Neville Nicholls

.

They were saying that this time last one there was the odd one forecasting

xxxxxxxxxxxxx

saying it could start November December

no the year before, I'll get you one of those too.

So compared to say the open learning, how would this kit compare?

It's different actually because you achieve something don't you (the kit)

Foe example there is big argument running all along the rivers, we on the Lachlan are different to the other rivers because we don't flow into anything and were having a big argument, for several reasons but one of the big ones is on allocations.

Last year as a result of this kit we wrote to the department and said that you are going to have floods because your allocations are too low, you're being too conservative you're keeping too much water back and the dam is 400ML shy of being full and the Rainman kit and the SOI kit says there's going to be rain. This was last year and of course we did have flood weather, we had three of them.

That doesn't mean it'll happen every time. Because you've got that probability..

What in particular did you find useful about the kit?

That sort of thing

if autumn is going to break what are you going to do with your sowing

and if its going to be dry maybe you'll get late frost so you should be growing a different variety of wheat.

Just a bit of forward planning but you don't forward plan it one hundred percent because you'll fall on your tit if you do.

Which bits of the kit did you use?

How do you mean?

Like do you look at the videos and the books or did you just look at one, or did you read through all the materials?

Oh yeah, yeah.

Did you find any one of the parts more useful or bad over any of the others.

No, No, I think, this is good little publication, its very interesting the views of the different farmers.

No I wouldn't think so.

Where do you get other sources of climate information from?

The fax thing (weather by fax)

Actually use it a lot for hay making. See in the summer, it's not much good in the spring or the early autumn because the hay takes longer, 4 days, when you are in the

summer, a four day forecast is enough to say right, you get your probabilities, sometimes you win and sometimes you lose, but on average you come out ahead.

Any other sources of information

I don't watch the news, it doesn't really interest me. Anytime I really want something I get weather by fax.

How effective do you think this kit is?

Well I think it is pretty effective, but it doesn't mean you use it a lot.

I've got a 'third shearer' (?) neutron probe. Do you know what that is? It measures the available water in the soil. I don't use it a lot but it is a very valuable tool.

Has anyone else used the kit besides you?

No

People would ring me up and ask me and I'd run out ....you know you have arguments with departments and you've got all these graphs.... and they say 'don't believe it' well then its up to them (from the kit)

you know you can run out a graph on anything

You can run out graphs from Rainman?

Yeah Rainman

Not from the kit, from Rainman

you can put your own data in.

My interest is the dam and how much water is in the dam and how much is available for irrigation. We've got over a hundred years of records of rainfall. Have you seen where it breaks up the rainfall for 50 year or 100 year period?

I haven't actually seen in Rainman?

Haven't you?

How do you think the kit has influenced you? Has it influenced you?

No not really because I was that way inclined anyway, but its ....

you're talking about the kit all the time which is this one (the kit) not Rainman

Yeah

oh you see I'm talking about Rainman

Well probably what all these farmers say, its just what you use it for.

The kit influenced me to get Rainman and I use Rainman to do the things I want to do.

When you are being presented information do you like to see science based information in there? For example when they are explaining El Nino they mention thermals, Walker circulation ...

Yeah

How did you find the explanations that they used ?

Oh its all right,

its not an easy concept you realise.

I wouldn't take myself to a lot of trouble, I'm just interested in the results.

I'm a bit sick of being, particularly scientist, producing stuff with no facts or references, probably 8/10 times exaggerating it to get funding, sick to death of it.

Do you think this does that?

No I don't think it does.

Because really in my book it was just trying to be a bit informative wasn't it.

So you think it was informative?

Oh yeah.

It was pitched at the right level?

It wouldn't want to be any more detailed.... things get too detailed and people don't want to read it. They'll read it if they get started and they get interested.

And you were already interested in this before you got it?

Yeah

do you have the internet here at all?

Yes

Do you use it much?

Oh I don't sit with it for hours. I only use it when I want to find something out.

What sort of things?

One thing was Hong Kong.

A friend of mind, I forget what he was getting.

You know I don't just sit and play with it

What would you say the message from the kit is

its a tool you can use and you can probably make a bit more money if you use it.

Finally, any suggestions on how to improve it?

Anything you would have liked to see in there that wasn't?

No I don't think so.

Something I've been trying to do.....
which is, if you start linking El Nino readings with rainfall and inflow with a dam you only get a 0.3 correlation not terribly high, but there is more to it than that.
You must have heard about Chaos theory.
The call up for Vietnam, there was a hell of a stink about that, cos certain months, more people were being called up than others. Correlations were 0.27 but the actual effect was much higher. How you can link that to El Nino and the actual results.....xxxxx
Unless they can come up with, ensure that it is more than 0.3 or 0.4 you're not going to get some government departments to take any notice, they are actually very conservative.
I'll just get you.....
Lot of farmers are pretty bloody dumb
In this area where we are we've had a pretty good run, and they say "what's the use of El Nino, we've had plenty of rain", they won't even look at the map and see that its only a little area around Forbes and down to Young / Condobolin and that the rest of the Eastern part is in drought. It's the worst it's been for a 100 years in the north, New Guinea and Indonesia, but if they happen to be in a favoured spot, it's no good, it doesn't work.
So I don't know how you.....
Would you say there is a difference between the people who have got this kit and those that haven't?
No, I wouldn't know.
Do you know of anybody else who has this kit?
Fellow I do a lot of work with I lent it to Ted Morgan down the road, he was interested.
Most of my friends were interested
Did you get any comments from them about it?
No just you know, that the thing was pretty good.
Do you keep any climate / weather records.
Nothing, just yearly rainfall.
I noticed you've got watershed and Rainman up there.
Watershed, don't use it.

You look at these (SOI v something graphs) they seem to show a better than 0.3 correlation. I've done them on Excel and I've done them back to 1900 I think.

Where did you get that sort of data from?

Rainman and myself, inflows into the dam. You can just feed you're own information into Rainman.

You see it's not really forecasting, its just giving you a statistical of what's happened. And if you really want to do something, see if you can find out how they simulate information back.

He heads off now to check on the irrigation and I look around the stuff in his room that he has given to me to look at.

- Graphs, lots that he has done
- Chance of rain v chance of rainfall, logarithmic.
- Big stack of New Scientists, some open to articles. Also Australasian Science
- URLs for internet on climate
- Experimental Long forecasting bulletin: National oceanic and atmospheric administration , US dept of commerce. Very scientific looking and jargon
- Rainman streamflow project case study establishment for the Lachlan river catchment. Lachlan catchment committee. Peter is a workshop participant, case study #3 Analyse the flooding over Wyangalla dam. Looking at allocations, and is evaluating a software package and tell about its ease of use.
- Involved fellow
- Computer, modem, speakers, etc.

Farm weather stock and grain, central western nsw, Bureau special services unit.

Based on this you are going to wait until Saturday?

Yeah

Would you be able to explain to me, based on this, what made you make that decision to wait out?

In this area we have a 30% chance of isolated showers Thursday, Friday we have 80% chance of storms and falls, and that buggers your hay and these here just show (maps) by Saturday there isn't any of that green black stuff so its not terribly likely but anyway we are going to wait because you don't need much rain on hay to make it from 160$/ton, if you get it wet you'll only get $100/ton.

and that's all there is to it.

It goes in 7 day cycles, mainly at this time of year.

You need four or five days clear weather to make you're hay (you can take that if you like)

How did you find out about this service?

Out of the kit, I think? Mary Voice and Grant Beard.

I noticed you've got a whole stack of New Scientists, do you get it as a subscription?

No I buy it each week, I buy it to get Wild.

I've got a really derry on most of the environmentalists because they're a pack of bloody liars. They just don't tell the truth.

That fellow Fred Pearce (New Scientist) nearly everything he writes is slanted and not factual. Gives me the shits.

Keeps me up to date on the water resources.

For a start, nearly all farmers are conservationists, because if they're not they're destroying they're destroying their livelihood, I'd say nearly 90%.

These environmentalists, and somebody said and I agree with them, really got started when communism collapsed and was proved a failure, there was this great heap of people who had this wonderful thing to hang onto and fight for , so now they've switched to the environment.

You ask me nearly anything you believe and I'll tell you it hasn't been proven.

You know asbestos is a load of bullshit.

Dioxin is, well if you get plenty of it it'll kill you but nearly anything will

DDT, which is the end of the war which got rid of malaria and what lice give you, what's it called..... Now they've got rid of DDT and they only thing they find wrong with DDT is that it built up, they couldn't find anything wrong with it.

2 million people a year die now of malaria.

What about this idea of resistance build up?.....Well if you continue to spray DDT now it would still be ineffective because the mosquitoes would be resistant.

Then they'd' have something else.

I'm a great believer in the human spirit. This is the first time in the world's history that there is enough food for everybody.....

I've finished with my questions now so anything you want to say....

Lots more discussion on environmental issues.